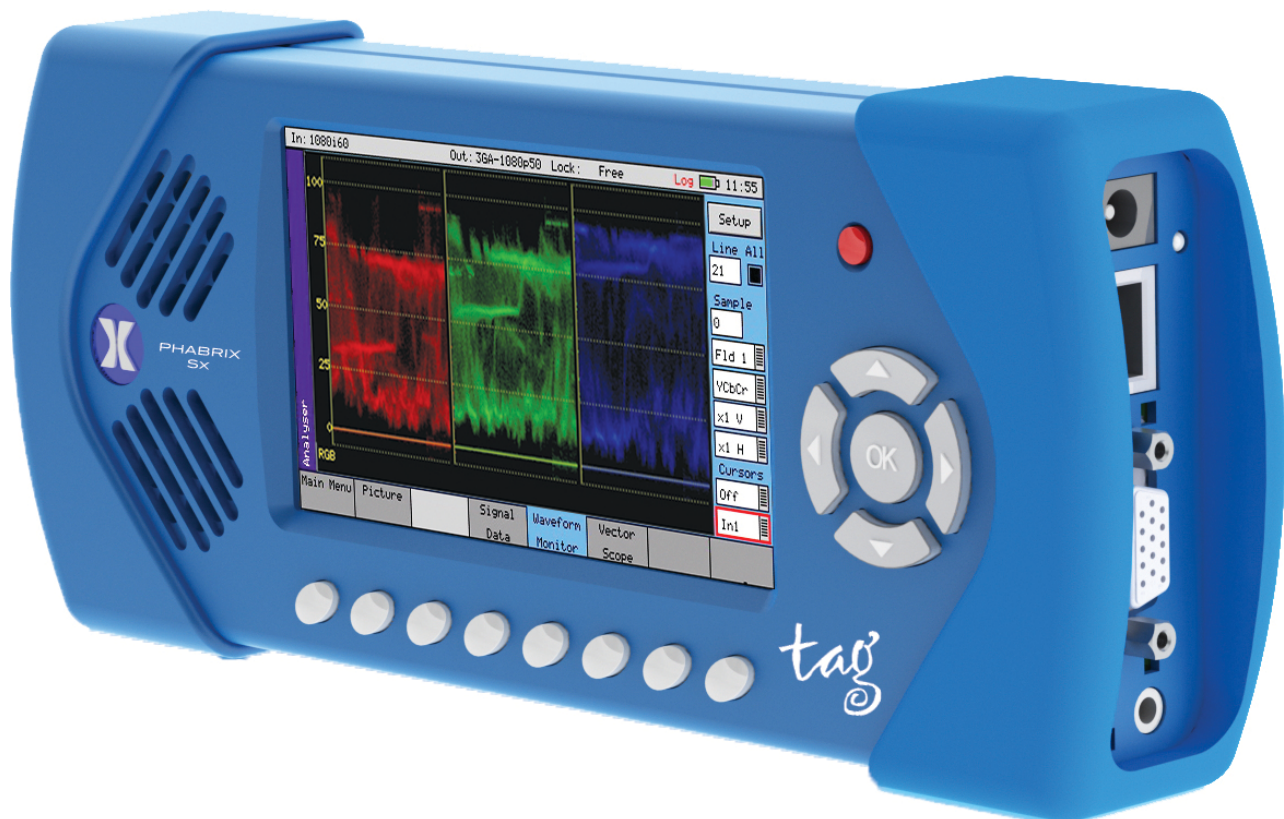


Sx TAG

User Manual

Software Release 2.01



Preface

About this Manual

This User Manual is a guide to the functions provided by your Sx Series instrument.

For further information on PHABRIX products, please refer to the PHABRIX web page:

<https://www.phabrix.com/products>

Notice

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Revision

This guide is a revision controlled document. Any changes to any page content will be reflected in the overall revision status of the whole manual.

Release	Date	Software Version	Updates Include:
1	February 2014	0.12.0024	First release of manual
2	July 2014	1.01.12275	Full product release
3	November 2014	1.02.12980	Power management
4	February 2016	1.04.13933	AV Generator pattern
5	June 2016	1.05.14132	EDID Option
6	January 2018	1.05.14132	AV Delay description
7	May 2018	1.06	SMPTE ST 2022-6 IP SFP functionality
8	May 2019	1.07	AV Delay Analysis
9	December 2019	2.00	SMPTE ST 2110-20/30/40 IP SFP functionality
10	November 2020	2.01	This release supports SMPTE ST 2110-31 together with NMOS IS-04 v1.2 and IS-05 v1.0. Note: NMOS is included only in 2110 mode and is not available in 2022-6 mode. Support for Riedel MN SET Configuration Software.
11	March 2021	2.01	Minor manual revisions.
12	May 2022	2.01	Reformat and minor updates.
13	July 2023	2.01	Minor user manual revisions.

Getting Started

Package Contents

The shipping box should include the following:

One black carrying bag containing:

- PHABRIX Sx TAG unit: PHSXTAGC (with Generator functions. Includes SFP CAGE)
- Power Supply Unit
- Mains lead
- User Manual and Firmware on USB key.

Note: Both the latest versions of the user manual and firmware are available from the Software Downloads section of the PHABRIX website:

<https://www.phabrix.com/support/product-software-downloads/>

The title page of this manual displays the supported version of the Sx TAG software.

General Safety



Avoiding Personal Injury

Warning: This instrument is designed for use by qualified personnel only.

No internal user-serviceable parts are provided. Units should be returned to your local PHABRIX agent for servicing.

The Operator must NOT remove the case from the unit as this will invalidate the warranty.

Do not spill any liquid onto the unit or its power adapter.

Warning: Do not look directly into the fiber optic connections of cable as this may cause permanent damage to the eyes.

Power Supply

Make sure that the unit is connected to the correct power supply voltage. A power supply adapter is supplied with the unit which may be connected to any AC power supply between 100 and 240 V AC at 50-60 Hz. Only the supplied power adapter should be used with the unit. Do not use a damaged AC cable with the unit as it may cause a shock or fire hazard. Replacement AC cables are available from your local PHABRIX agent.

Installation Environment



Operating Temperature

Warning: The unit should only be operated between 0 and 40°Celsius. If the unit is operated at a higher temperature, there is a possibility of a fire hazard. If the temperature is changed rapidly from a cold environment to a hot environment, moisture can be created internally which can cause malfunction or damage the unit. Allow the unit to sit for 30 minutes without power applied to reduce any possibility of condensation. If the temperature rises above 60°Celsius a warning dialog will be given. If the temperature rises above 65°Celsius the unit will be turned OFF. Under both conditions, an event will be added to the event log to show what happened.

Input/Output Terminals

Do not connect the input or output BNC connectors to external power as this can damage the internal circuitry and cause the unit to work incorrectly.

The BNC connectors fitted on this unit are 75 ohm type which are not compatible with 50 ohm plugs.

Warning: The use of 50 ohm plugs will permanently damage the connectors on the unit. The use of 50 ohm plugs is considered to be misuse of the equipment and will therefore invalidate the unit's warranty.

SFP Cage

Warning: When the SFP cage is fitted, either an SFP or a bung must be fitted in the SFP cage at all times to prevent the Sx TAG overheating.

When Not in Use

Disconnect the unit from the power supply and AC power source when not in use.

Maintenance

Wipe the case, and knobs gently with a soft cloth, lightly dampened with a neutral cleaning agent. A screen cleaning cloth may be used to clean the LCD. Do not apply force to the LCD when cleaning or it may be damaged.

Warning: Remove the power supply from the unit and turn OFF before cleaning. Do not allow any water or other liquid to enter the unit while cleaning.

Disposal of Equipment



This product is subject to the European WEEE (Waste Electrical and Electronic Equipment) directive and should be disposed of according to the regulations of each country.

Contains hazardous substance information

Part number: **PHSXTAGC**

Description: PHABRIX Sx TAG



China RoHS is a two-step process that identifies concentration limits of certain hazardous substances in electronic information products that are sold into China. Per the deadline set by the Chinese government, March 1, 2007, PHABRIX Limited has implemented step one of China RoHS, self declaration of hazardous materials and marking of the product.

PHABRIX products that are sold into the China market have the required marking as indicated by the symbol shown left applied to the product designating that the product meets the China RoHS requirements.

Toxic or Hazardous Substances or Elements

Parts	Hazardous Substances in each Part					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chrome (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Assembled board	○	○	○	○	○	○
Mainframe	○	○	○	○	○	○
LCD	○	○	○	○	○	○
Fan	○	○	○	○	○	○
Wire assembly	○	○	○	○	○	○
Enclosure	○	○	○	○	○	○
Accessory	○	○	○	○	○	○
Packaging	○	○	○	○	○	○
Battery	○	○	○	○	○	○

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

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Description

Sx TAG Instrument Overview

Configured as an entry level portable Analyzer, the TAG can be easily upgraded using a range of software options to provide a sophisticated instrument for testing broadcast infrastructures.

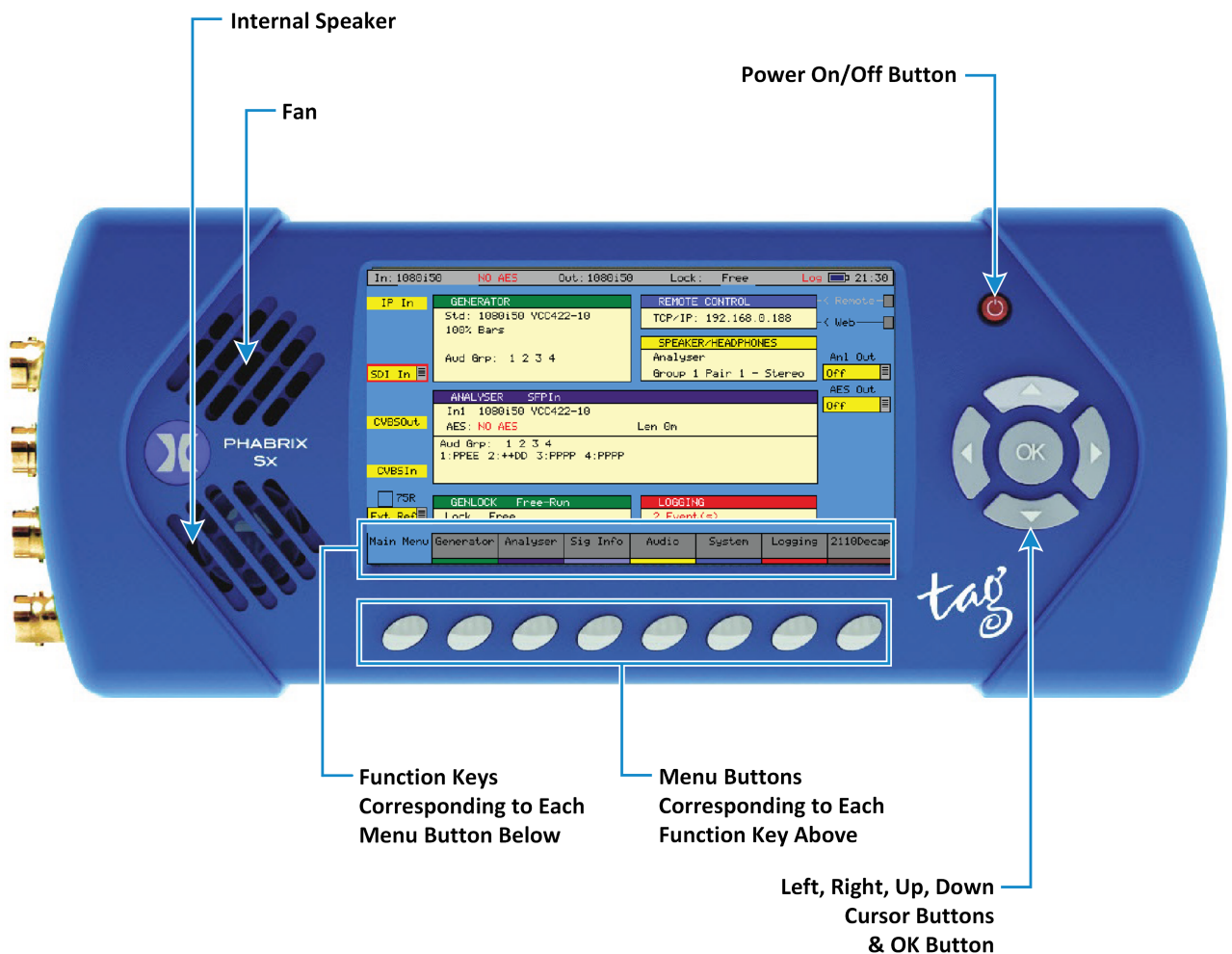
The PHABRIX® TAG has been created to incorporate new interfaces that appeal to customers looking for a cost-effective entry into professional test and measurement.

The PHABRIX TAG includes support for SD-SDI and HD-SDI as standard with the option to upgrade to 3G-SDI (Level A and Level B); SMPTE ST 2022-6 and SMPTE ST 2110-20/30/31/40 with NMOS IS-04 v1.2, IS-05 v1.0 and IS-08 v1.0.1.

Composite analysis and generation have been incorporated to support those regions making the transition between analog and digital television.

An SFP cage has been integrated into the design principally for optical infrastructure testing, and SMPTE ST 2110/2022-6 encapsulation and decapsulation; however, the cage will support a wider range of SFPs as they become available (see the PHABRIX website for information on supported SFPs.) Composite locking reference generation and input reference waveform analysis have also been included.

For audio support the PHABRIX TAG includes a D15 breakout connector providing both balanced analog and AES input/output. AES waveform display allows a visual check of levels and reference lock. Advanced audio features including Dolby E, Dolby Digital and Dolby Digital Plus are supported allowing TAG to be considered as a replacement for the discontinued Dolby DM100.



Switching the Instrument On and Off

To switch on your PHABRIX Sx Instrument press the red button at the top right-hand corner of the front panel.

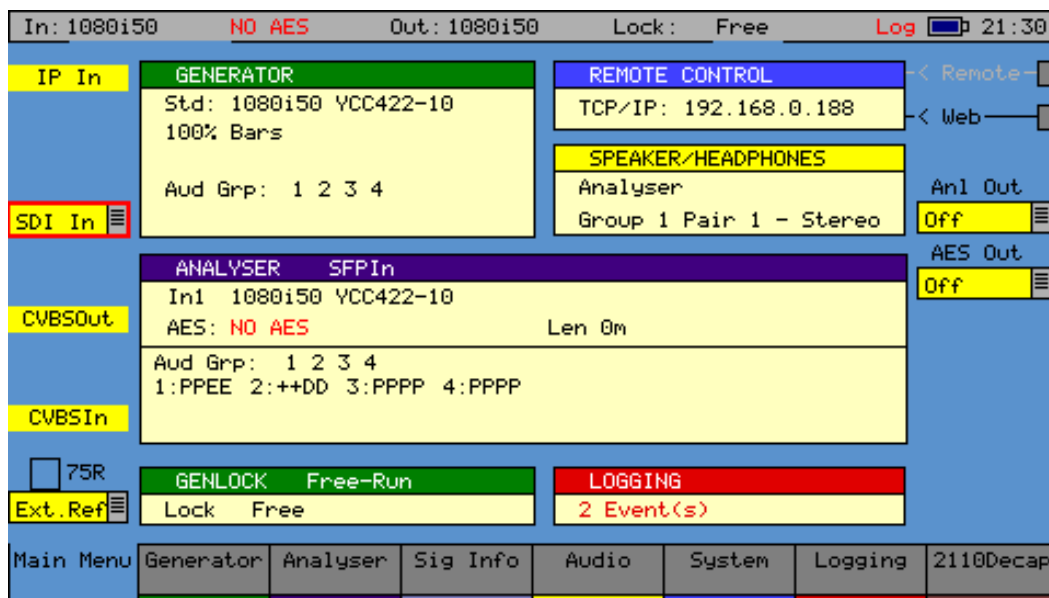
Once the system has started, pressing the button again will turn it off. If for some reason the instrument stops responding, pressing and holding the button for a few seconds will turn it off.

The unit is battery operated and the battery should last for between 1.5 and 3 hours dependent on which video standard is being used and whether the input and outputs are active. If the unit is switched on and the battery is almost discharged, it will turn itself off. If the battery level becomes too low for operation a dialog will be displayed prompting the user to turn off the unit. The current settings will also be saved. The unit should then be connected to the power supply unit as soon as possible to recharge the battery. The battery should be fully charged in about four hours. The battery will charge faster if the unit is switched off while charging.

Menu Operation

Main Menu

The Main menu, displayed on the TFT LCD screen gives access to the software modules available on the Sx TAG instrument. The buttons below the screen correspond to the menu areas. Pressing on any of these buttons will display the corresponding menu.



The Main Menu provides an overview for the system. It shows the video input and output standards and frame rate. The audio status for the generator shows which audio groups are being generated whilst the audio status for the input shows which groups are present and an overview of the channel status for each audio channel.

Audio channel status is displayed as:

- **P** if PCM audio is present
- **N** if Non-PCM audio is present
- **E** if Dolby E packets are present
- **D** if Dolby Digital packets are present
- **+** if Dolby Plus packets are present
- **V** if the validity bit is set

Dolby E program configuration and Timing status is also displayed if the Dolby E analysis option has been purchased and a Dolby E signal has been detected on the selected input. If the generator is generating errors, then the video standard is displayed in red. If the input detects errors, then the input standard will be displayed in red if the analyzer is monitoring the input.

If the unit is connected to the network, the current TCP/IP address of the unit is displayed in the Remote Control box. If the unit is NOT connected to a network and is set to DHCP mode, it will show 'acquiring' to show that the connection hasn't been made yet. The model type is displayed at the bottom right corner of the screen.

Instrument Status

The top line of the menus shows the unit status and includes the Input Video status, Genlock status, battery status and current time. If the unit is being powered by the AC adapter, the battery status icon will change color to yellow. If a command script is being run, this is shown on the top line to the left of the time as **Script**. A red **Log** label is displayed on the status line if there are any events in the event log.

If a 3G video standard is selected the video standard display will be shown as 3GA if it is a 3G-Level A standard, 3GB if it is a 3G-Level B dual link standard, 3G2 if it is a 3G-level B dual stream (two patterns) standard or DL if it is a dual link output.

The input video standard will be shown in red if the input signal has errors, but only if the analyzer is connected to the input. If the analyzer is set to monitor the output, the input standard will be shown in brown.

The output standard will be shown in red if the instrument is generating errors. The output standard will show OFF if the generator output is Off.

Using the Menus

The Main menu is the top-level menu from which all other menus are selected on the instrument. The main menus are:

Generator:

(Only present if a Generator module is fitted) Allows video test pattern selection to be made and audio test tones to be selected.

Analyzer:

Allows the selected Composite, SDI or SFP input signal to be analyzed in the form of a Picture, Waveform monitor and Vectorscope.

Sig Info:

Allows detailed signal information about the video and audio status for the analyzer source to be displayed.

Audio:

Gives access to the Audio Meters and Audio Status displays.

System:

Allows the setup of system wide settings including memories, date/time and software.

Logging:

Selects the logging page to view and setup the error logging system.

2022/2110:

Allows the setup of 2022-6 or 2110 encapsulation or decapsulation on the unit, for IP packet transmission or reception.

See [Menu Reference](#) for full details of these menus.

The Menu buttons select which instrument is in use as well as selecting the options for the instrument. The bottom of the display shows the function of each Menu button.

When in a specific function e.g. Generator, Analyzer etc., the cursor controls on the right-hand side of the instrument select a field to edit. The current field has a red box around it. Pressing the OK button starts or ends editing of that field. Checkboxes are always in edit mode and pressing the OK button inverts the current state.

When editing some types of fields, the menu buttons at the bottom take on different functionality to allow cancelling edit mode or setting the value for the field. When lists of options are displayed the menu buttons allow selection of the first/last item in the list as well as paging through the available options. If the list of items is small, the available items may be displayed on the menu buttons for instant access.

The buttons along the bottom of the display change the currently displayed page when not editing a data field. The left-hand button always selects the top-level menu and system overview page. So, for example pressing the first button will select the **Main Menu**, selecting the second button will select the **Generator** menu, selecting the third button will select **Analyzer**, etc.

Input / Output Selection

The Sx TAG has two bidirectional BNC connections, one for Reference input / output and the other for SDI video input / output.

The direction of SDI I/O connection is selected on the Main Menu using the dropdown lists as well as in the **Output** section of the **Generator → Video Out** menu. Note that if the Generator software option is not installed then this connection will be an input.

The direction of the Ref I/O connection is selected on the Main Menu using the dropdown list or in the **Reference Out** section of the **Generator → Genlock** menu where it is controlled by the “On” checkbox.

If the SMPTE ST 2022-6/2110 IP SFP module (Option **PHSFP-10SR-IP**) is fitted, the mode of operation - *Encap* (encapsulation) for output, *Decap* (decapsulation) for input - can be selected using the **SFP Mode** button in the **2022/2110 SFP Setup** menu. The current mode (Encap or Decap) will be displayed in the title bar at the left of the 2022/2110 menu page.

The input to be monitored using the Analyzer can be selected in the dropdown list in the bottom-right corner of the active instrument (Picture, Waveform, Vectorscope, Signal Data and others.)

If an SFP module is fitted the SFP Input can also be selected from this dropdown list to be monitored using the Analyzer.

Both AES and Analog audio output can be enabled using the dropdown menus on the Main Menu.

Sx Software Options

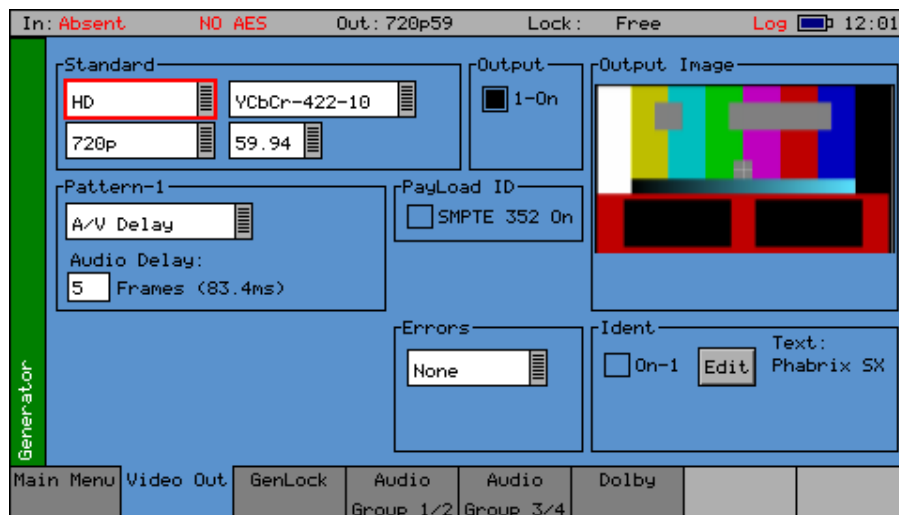
Overview

The instrument has a range of software options that can enhance its functionality for specific applications.

AV Delay Analysis (Option: PHSXO-AVD)

The AV Delay Analysis option (**PHSXO-AVD**) offers an end-to-end solution for the measurement of the Audio to Video differential delay through a broadcast system, when used in conjunction with the AV Delay Generator. The analyzer tool provides a real-time update of the differential delay between the video and the selected audio channel pair. When using the SxA and SxE, this tool can also be used to measure the propagation or pipeline delay of either video or audio.

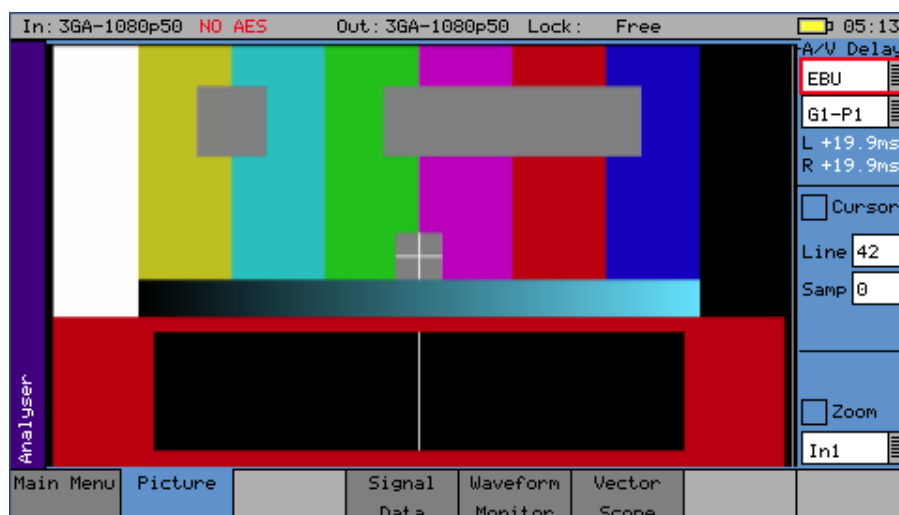
Both the AV Delay signal generator and analyzer can be used with all Sx supported video formats and frame rates on SDI and AES interfaces.



The AV Delay Generator produces an adapted EBU Tech 3305 AV Sync *clapperboard* Test Pattern. This is compatible with third party AV delay analyzers such as the LAWO V_pro8.

An audio delay offset with respect to video of up to ± 40 frames can be applied in increments of one frame.

The AV Delay audio pulse can be inserted on up to 16 embedded SDI audio channels, plus the AES out.



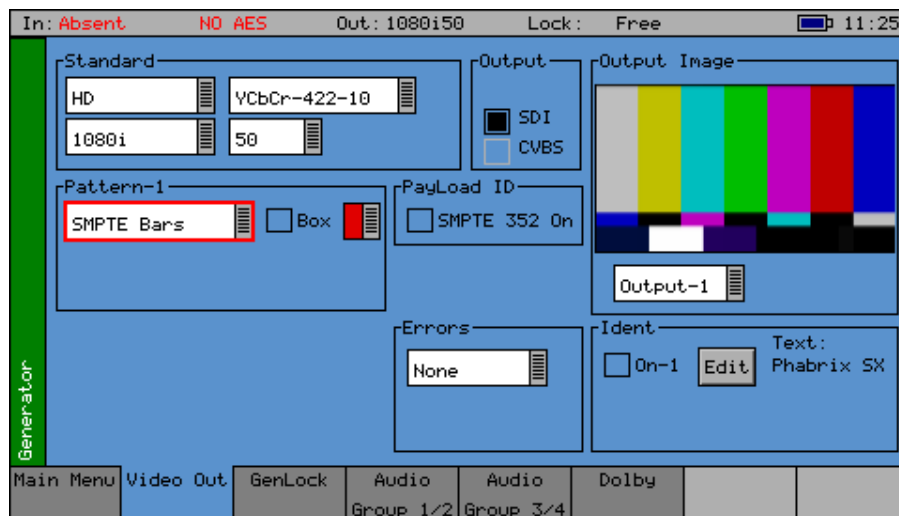
AV Delay measurement (**PHSXO-AVD**) is available in the Picture instrument. Measurement of two AV Delay test patterns is supported:

- EBU Tech 3305
- LAWO V_line AV Sync test pattern

The tool provides a real-time update of the differential delay between the video and the selected audio channel pair.

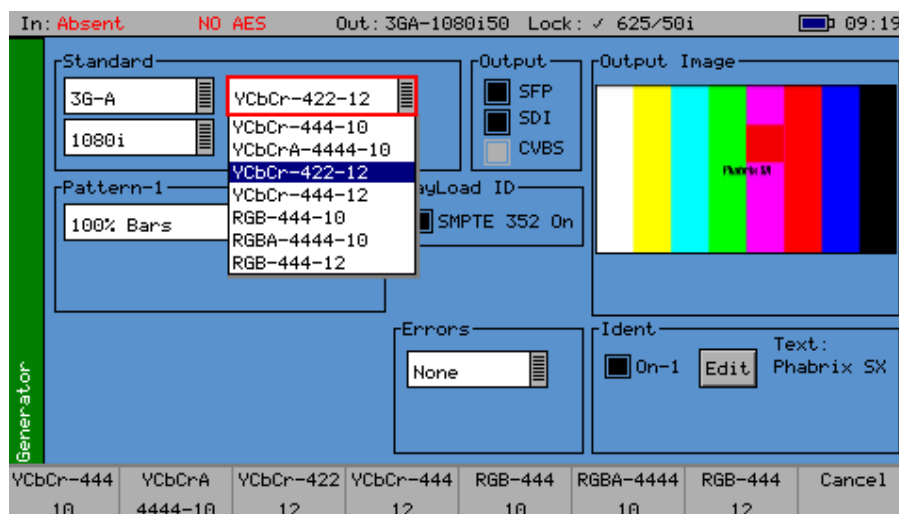
The source of the audio can be either an embedded SDI audio or AES channel pair. The differential delay between the video and the selected audio is measured in 0.1 ms steps (to an accuracy of 1 ms) with a measurement range of +/- 400 ms.

Generator Option (Upgrades PHSXTAG to PHSXTAGC)



The Generator option (**PHSXO-GEN**) allows the creation of video test signals for analog composite video, SD-SDI and HD-SDI video as standard; additionally, 3G-SDI (including advanced video formats) 2K SDI, and Fiber video functionality, if these options have been purchased. The Generator option also allows the generation of both analog and digital audio test tones and allows the unit to be locked to an external locking reference.

3G-SDI, Advanced Formats and 2K Support (Option: PHSXO-GADV)



This option (**PHSXO-3GADV**) provides 3G-SDI Level A and B support including advanced formats: 4:2:2 YUV, 4:4:4 RGB and 4:4:4 YUV at 10/12 bit, and 2K advanced formats including: 4:2:2 YCbCr, 4:4:4 RGB' and 4:4:4 YCbCr at 10/12 bit as well as 4:4:4 XYZ at 12-bit. For broadcast manufacturers this

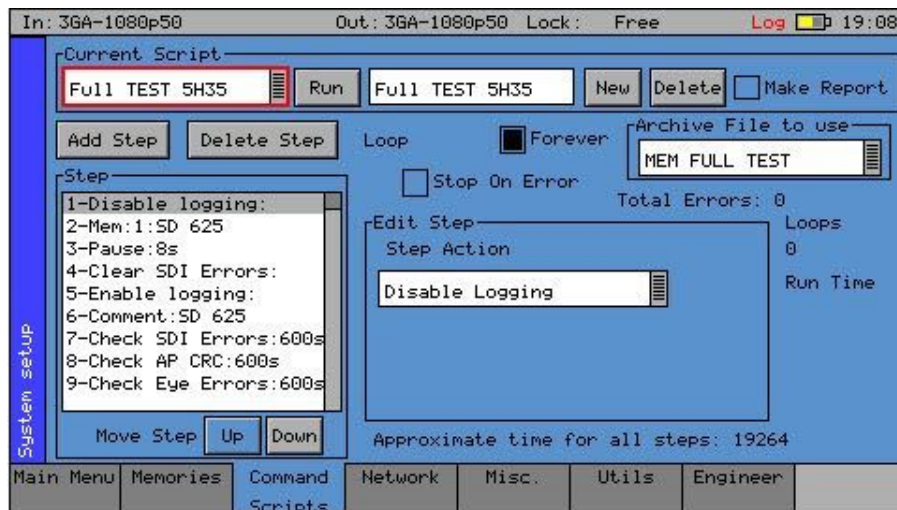
option allows rigorous testing of many more formats beyond the standard signals used in traditional broadcasting.

The 2K-SDI support provides analysis of, and test pattern generation for, 2K Digital Cinema as defined in the SMPTE ST 2048-2:2011 standard *2048 x 1080 Digital Cinematography Production Image FS/709 Formatting for Serial Digital Interface* and SMPTE 428-9 *D-Cinema Distribution Master - Image Pixel Structure Level 3 - Serial Digital Interface Signal Formatting*.

Among the support for 3G Level B on the Sx TAG is the ability to generate and analyze signals such as SMPTE 425-B carrying 1 x 372M dual link payload.

Uniquely the PHABRIX units create three pathological signals in all formats which will be of great interest to broadcast manufacturers. The first is as defined in SMPTE RP198 and is the split field signal with the equalizer test in the first half and the PLL test in the second half. The second and third are separate full-frame EQ test and PLL tests signals. To maintain a regular parity distribution and mitigate any DC offset, the EQ part of the pattern inverts a bit at the start of the first line in each alternate frame. This is the form of 3G Level B Pathological signal that many video manufacturers are adopting as their test signal of choice as it stresses electronic circuits more thoroughly.

Command Scripts with Print Report (Option: PHSXOS)



The Command Script and Reports option (**PHSXOS**) allows a series of predefined actions to be run through within the PHABRIX Sx using a script stored in internal memory.

The command scripts option can be used to automatically step through a sequence of instrument states, controlling the generator, analyzer and logging functions. If required, the instrument will prompt the user before going onto a subsequent state.

Applications include repeated test sequences as required by manufacturer Test Departments, Research and Development Departments, Systems Integrators and Commissioning/Support Engineers.

A script requires a set of memories to configure the unit and then a script file which recalls those memories and specifies times and actions for each step. The process of creating a command script requires these two files to activate the sequence.

Additionally, a script can be created as a simple text file on a PC and then transferred to the unit over the network and recalled at any time. Many named scripts and memories may coexist in the instruments store to be recalled as required.

Access to the Command Scripts functionality is the menu: **System → Command Scripts**. See the chapter [Menu Reference](#) for details.

SDI Data Display and VANC/ANC Inspector (Option: PHSXOSD)

In: 1080p50		Out: 1080p50						Lock		Free		10:01			
		2635	2636	2637	2638	2639	0	1	2	3	4	5	6	Type	
Analyser	36	Y	040	3FF	000	000	2AC	040	040	040	040	040	040	Grid	
		C	200	3FF	000	000	2AC	200	200	200	200	200	200		
	37	Y	040	3FF	000	000	2AC	040	040	040	040	040	040	Line	
		C	200	3FF	000	000	2AC	200	200	200	200	200	200		
	30	Y	040	3FF	000	000	2AC	040	040	040	040	040	040	41	
		C	200	3FF	000	000	2AC	200	200	200	200	200	200		
	39	Y	040	3FF	000	000	2AC	040	040	040	040	040	040	Sample	
		C	200	3FF	000	000	2AC	200	200	200	200	200	200		
	40	Y	040	3FF	000	000	2AC	040	040	040	040	040	040	0	
		C	200	3FF	000	000	2AC	200	200	200	200	200	200		
	41	Y	040	3FF	000	000	2AC	040	040	040	040	040	040		
		C	200	3FF	000	000	200	200	200	200	200	200	200		
	42	Y	040	3FF	000	000	200	040	081	157	294	36A	3AC	3AC	
		C	200	3FF	000	000	200	200	200	200	200	200	200		
	43	Y	040	3FF	000	000	200	040	081	157	294	36A	3AC	3AC	
		C	200	3FF	000	000	200	200	200	200	200	200	200	Hex	
44	Y	040	3FF	000	000	200	040	081	157	294	36A	3AC	3AC		
	C	200	3FF	000	000	200	200	200	200	200	200	200	10bit		
45	Y	040	3FF	000	000	200	040	081	157	294	36A	3AC	3AC		
	C	200	3FF	000	000	200	200	200	200	200	200	200	Inp		
◀ 10		▶ 10		◀ 100		▶ 100		▼ 10		▲ 10		▼ 100		▲ 100	

The SDI Data Display and VANC/ANC Inspector option (**PHSXOSD**) provides the engineer with a detailed view of the data words contained within the SDI stream. This allows the analysis of complex faults and is particularly useful when determining compatibility issues between equipment and when debugging new product developments particularly in a research and development environment. Detail in the active SDI stream can be viewed with continuous update.

The SDI Analysis option provides the following functional areas:

Grid:

Displays the SDI data in the form of an array.

Stream:

Allows the SDI continuous data stream to be viewed.

Component:

Allows the video components to be displayed in separate columns.

Split:

Allows the video components to be display individually.

Ancillary Data:

Allows the user to capture whole ancillary data packets identified by their data id (DID).

Ancillary Status:

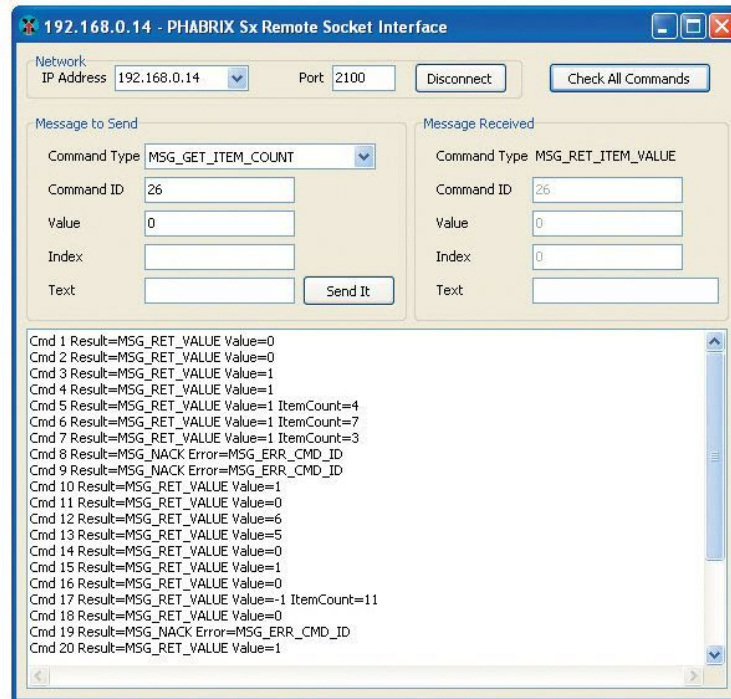
Allows additional user defined selections with the appropriate DID or SDID code.

Access to the SDI analysis functionality is through the menu **Analyzer → Signal Data**. See the section [Signal Data](#) for details.

This option also provides a VANC/ANC Inspector - allowing Ancillary data packets to be detected and checked for errors.

Access to this functionality is through the menu **Signal Information → ANC Inspector**. See the section [ANC Inspector \(SDI Data Option: PHSXOSD\)](#) for details.

Enhanced Remote Control (Option: PHSXOR)



The Enhanced Remote Control Integration option (**PHSXOR**) gives users full remote control of the unit through TCP/IP Sockets to allow any aspect of the unit to be modified or queried.

This allows complex applications to be created to perform test and measurement functions such as automated testing of routers or other broadcast equipment.

PHABRIX products act as a server and listen on a port waiting for incoming requests from clients such as a PC. Using this method of communication the Sx range can provide a variety of information to the control device to which it is connected and be controlled in specified areas of the product using the command details included. All visual controls on the product have an associated command.

Messages may be sent to *SET* or *GET* data from a command. For example, if you SET a value, the unit will be configured accordingly and a reply returned and if you GET a value from the unit, it will reply with that value. All messages are acknowledged to increase the security of the interface i.e., using closed-loop communication.

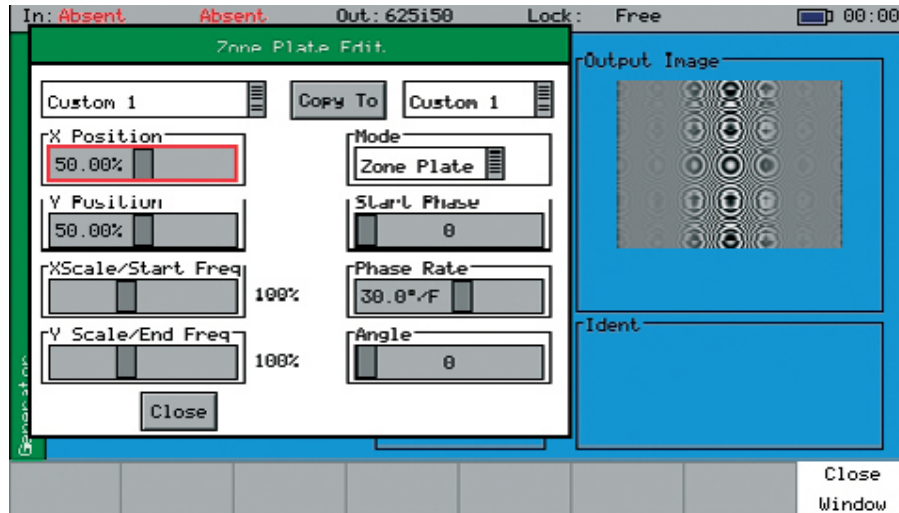
The control structure can be selected as Passive or Active. Passive control allows simple remote control where the host PC is in control and sends commands when it wants to change data or get information. It is this method which is the most popular use for remote control.

Active control is when the PHABRIX unit synchronizes with the host PC. Any changes on the PHABRIX unit will result in a message being sent to the host PC. This method is useful for controlling a PHABRIX unit from another unit or via the PC simulator software. It requires more complex software on the host to respond to the returned messages.

The option provides a programming guide with command information and examples, and can be downloaded from the PHABRIX website. A Windows™ application for testing the interface is also provided as part of this option.

See the *Sx Remote Control Guide* for details.

Programmable Zone Plate (Option: PHSXOZ)



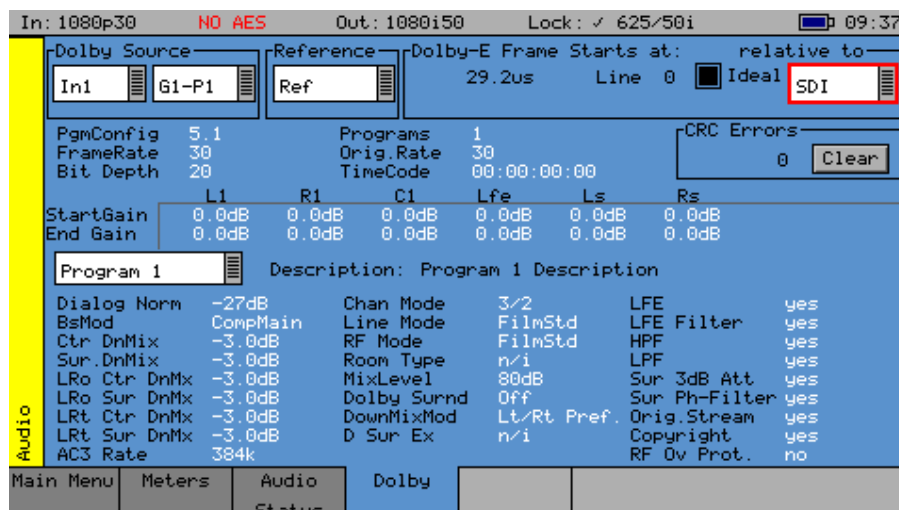
The Zone Plate Generator option (**PHSXOZ**) adds a range of preprogrammed zone plate patterns along with user-defined controls over several parameters which can be saved to custom buffers.

Using the **System → Memories** menu window, multiple saves of zone plates can be saved to the system by checking the video box and saving by name. In use, the zone plate can be used to test a range of video processing requirements using horizontal, vertical and temporal (time) controls. Temporal control is particularly useful for testing up/down converters and applications which compress signals.

Aspect ratios can be tested using the horizontal and vertical controls. Frequency sweep is particularly useful and also available using this option. By feeding in the generated signal, the output of the device can be sent back into the waveform monitor of the Sx instrument to determine the usable bandwidth of the system. Once purchased, the zone plate editor is accessed by selecting the button next to the standard zone plate.

Dolby Bit-stream Analyzer and Generator (Option: PHSXO-DAG)

The Dolby bit-stream analysis and generation option (**PHSXO-DAG**) displays Dolby E, Dolby Digital and Dolby Digital Plus metadata present in a selected audio stream and determines whether the Dolby E packet is timed correctly on the SDI video stream. It also uniquely adds significant Dolby E, Dolby Digital, and Dolby Digital Plus metadata generation features to the Sx range.



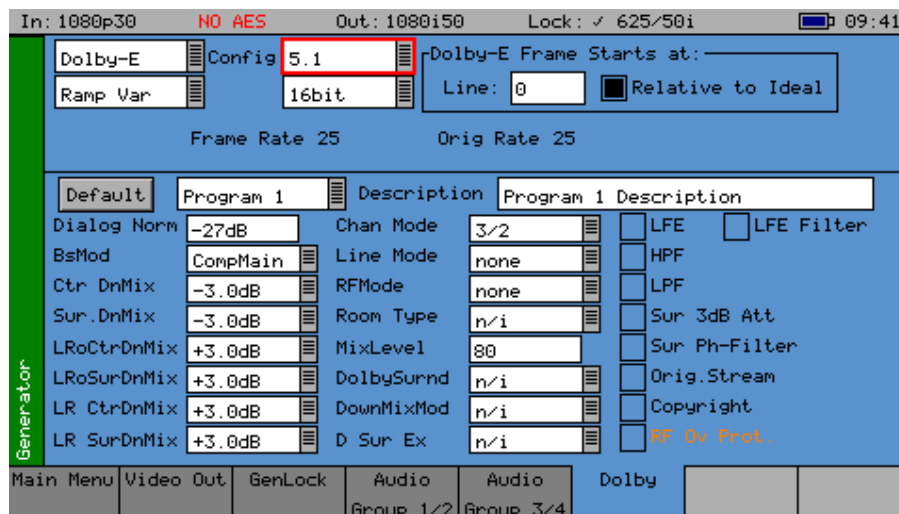
The Dolby audio may be monitored from any of the SDI input embedded audio channel pairs or the AES input. Peak audio levels are also displayed for Dolby E.

The start menu window displays both the V Bit information and PCM values along with a snapshot of the Dolby audio metadata if a Dolby is present. Using the Signal Information - Dolby menu will present the full analysis display which forms the major analytical tool for this option.

The Dolby metadata screen carries primary information including signal source, Dolby E *guard band* timing, CRC errors, program channel and metadata detail. The characters shown in white will only be presented when a Dolby signal is introduced into the unit.

Peak audio levels included in the Dolby E metadata packet are displayed, allowing the user to select the appropriate set of meters to display Dolby levels which will follow the selected Dolby source. Logging for Dolby errors, Dolby E Timing, Common metadata, and Program metadata can also be controlled.

Note: This option does not decode Dolby audio



The Dolby generation capability provides broadcast engineers with a highly functional set of tools for Dolby E, Dolby Digital and Dolby Digital Plus streaming. It is unique in being the world's first metadata Dolby generator with editable profiles.

With a selection of Dolby streams to choose from, engineers can quickly enter and adjust parameters to check broadcast infrastructure.

This option allows the display of Dolby metadata present in a selected audio stream and determines whether the Dolby E packet is timed correctly on the SDI video stream.

Dolby streams are provided for all program configurations with fixed audio data. Among the tools included in the Dolby E streaming option is the ability to adjust the *start of frame* for Dolby E packets.

The generated Dolby audio follows the video generator reference source. There is also the ability to edit the program configuration and bit depth with fixed audio signal. The PCM stream can be carried on any embedded or AES pair. The option can set the video line number where the internally generated Dolby audio test stream begins. Metadata can be edited by the user and stored in memories.

The option allows a closed loop test scenario with both generation and analysis toolsets.

Note: This option does not generate Dolby audio.

Ancillary Data Status (Now Included as Standard)


In: 3GA-1080p50		Out: 3GA-1080p50		Lock: Free	16:30	
Signal Information	Source	In1	Ancillary Packets Status		Setup	Reset
	RP165-EDH	S272-SD Audio	S272-SD Aux	S272-SD Ctrl		
	S299-HD Audio	S299-HD Ctrl	S315-Can. Pos.	S353-MPEG Recod		
	S305-SDTI	S348-HDTI	S427-Lnk.Enc 1	S427-Lnk.Enc 2		
	S427-Link Enc	S352-Payload	OP47 Transport	OP47 Dist.		
	ITU-R BT 1685	RP214-KLV-V	RP214-KLV-H	RP223-UMID-ID		
	S2020-Audio	RP215 - Film	EIA-708 Caption	EIA-608 Caption		
	RP207 - Program	RP208 - VBI	S2010-SCTE MSGS	S2016-3 AFD		
	ARIB-B.22	ARIB-B.23-1	ARIB-B.23-2	ARIB-B.27 Capt.		
	ARIB-B.35	ARIB-B.39	ARIB-B.37 Ana	ARIB-B.37 HD		
	ARIB-B.37 Mob.	ARIB-B.37 SD	S2031-SCTE VBI	S2016-4 PAN		
	RP196-HANC	S12M-2 V-TCODE	RD08-WSS	RP196-VANC		
	Mark Deleted	User-1	User-2	User-3		
	Missing	Present	!Checksum	>Stream	+DBN	?Parity *Previous
	Main Menu	Video	Misc	Audio	ANC	ANC
		Status	Status	Status	Inspector	Status
						Dolby-E
						Video
						Timing

The Ancillary Status option (**PHSXOVNC**) provides broadcasters, studios, OB and broadcast manufacturers with a detailed analysis of the ancillary data present in an SDI signal.

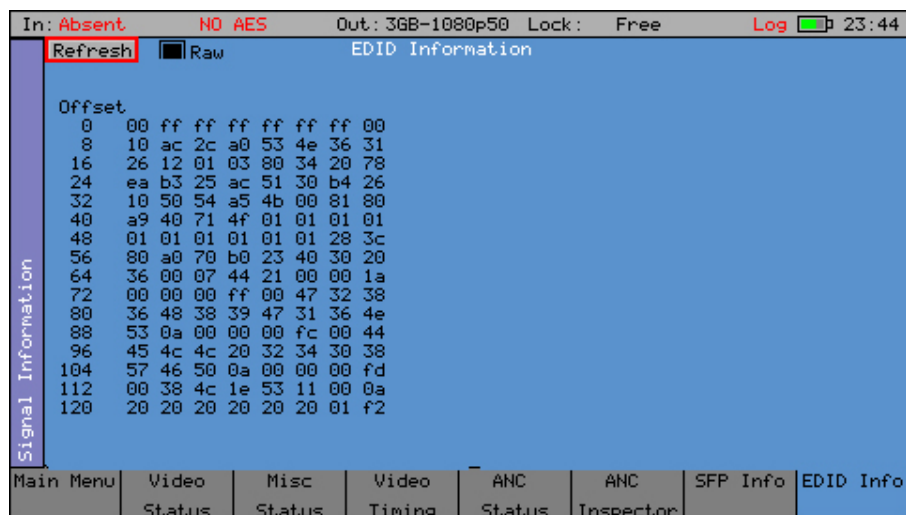
A simple grid layout provides a quick check for an engineer of the available VANC/ANC ancillary data. The packet type is then displayed as present, absent or red if in error. Simple icons next to the packet indicate the fault. Each ancillary packet available from the grid view can be set to enable logging and then presented together with other information in the events window of the logging menu.

This option further allows additional, user-defined selections with the appropriate DID or SDID code. Any ancillary packet code can be saved down for future recall. Note that this option does not fully decode the ancillary data, but instead it is used to identify whether the packet is present in the signal.

HDMI EDID Display (Requires Option: PHSFP-HDMI-OUT)

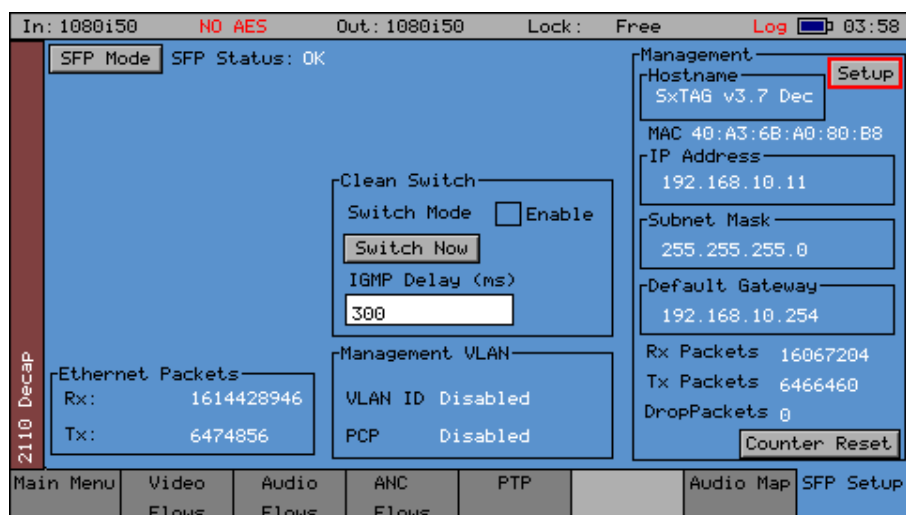
In: Absent		NO AES		Out: 3GB-1080p50		Lock: Free		Log  23:44		
Signal Information	Refresh	<input type="checkbox"/> Raw	EDID Information							
	Section	Monitor		Estb. Modes	720x400@70,640x480@60					
	ModelName	DELL 2408WFP		Estb. Modes	800x600@72,800x600@75					
	VendorName	"DEL"		Manufacturer	Specific=0x00					
	Product Code	41004		Horizsync	30-83					
	SerialNum	825642579		VertRefresh	56-76					
	Manufactured	week 38 of 2008		Maximum pixel	clock is 170MHz					
	EDID Ver	1.3		Modeline	"1920x1200" 154.00					
	Type	Digital Display		1920 1968	2000 2080 1200					
	VESA DFP	no		1203 1209 1235	+hsync -vsync					
	Display Size(cm)	52 x 32		Not giving standard mode:						
	Gamma	2.20		1280x1024@60 5:4	Clock=78.00 Mhz					
	DPMS	standby suspend off		1600x1200@60 4:3	Clock=115.00 Mhz					
	Colour Support	RGB444+YCC444		1152x864@75 4:3	Clock=74.00 Mhz					
	Standard sRGB	No		EDID Ext Blocks: 1						
	GTF	No								
Preferred timing found										
Red X/Y(CIE)	690 327									
Green X/Y(CIE)	192 723									
Blue X/Y(CIE)	152 66									
White X/Y(CIE)	321 337									
Main Menu	Video	Misc	Video	ANC	ANC	SFP Info	EDID Info			
	Status	Status	Timing	Status	Inspector					

The HDMI EDID viewer option (**PHSXO-EDID**) displays both decoded EDID information and RAW ancillary data in a tabular display. It obtains the EDID information using a dedicated SFP and cable (**PHSFP-HDMI-OUT**), which must be purchased separately. For those customers requiring support for 3G formats, an additional license (**PHSXO-3GADV**) will be needed.



Additionally, the HDMI EDID display option can be used in conjunction with the generator, providing an SDI pattern which is generated through the HDMI SFP which can be used to test a monitor display.

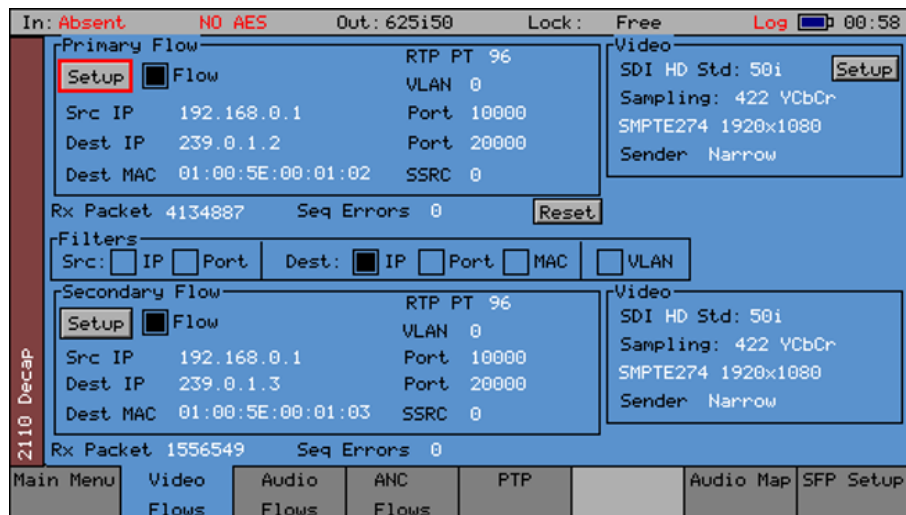
IP Encap/Decap License (Requires Option: PHSFP-10SR-IP)



This option (**PHSXO-IP**) provides support for SMPTE ST 2110-20 / -30 / -31 / -40 encapsulation/decapsulation with ST 2059 PTP, as well as SMPTE ST 2022-6 (SDI video over IP) encapsulation/decapsulation modes, using 10GE IP SFP+ modules developed by Riedel (**PHSFP-10SR-IP**). The SFP can also be managed remotely and NMOS IS-04, IS-05 and IS-08 are supported.

Hybrid IP/SDI features include SDI-to-IP and IP-to-SDI conversion gateways for both ST 2110-20 / -30 / -31 / -40 and ST 2022-6 as well as the ability to generate an analog reference output that is frequency locked to the ST 2059 PTP or 2022-6 IP input.

Dependent on the mode selected, a network configuration menu for either Flow (IP media) packet transmission (2022Encap / 2110Encap) or reception (2022Decap / 2110Decap) is provided, supporting both multicast (IGMP) and unicast, including filtering by MAC address, UDP ports, and source IP. The Synchronization Source (SSRC) Identifier header field for RTP is also supported.



The video flow menu additionally displays the video standard in use, and transmit and receive packet information - with the option to monitor just Flow packets, Ethernet (Flow plus wrappers), or web management packets only.

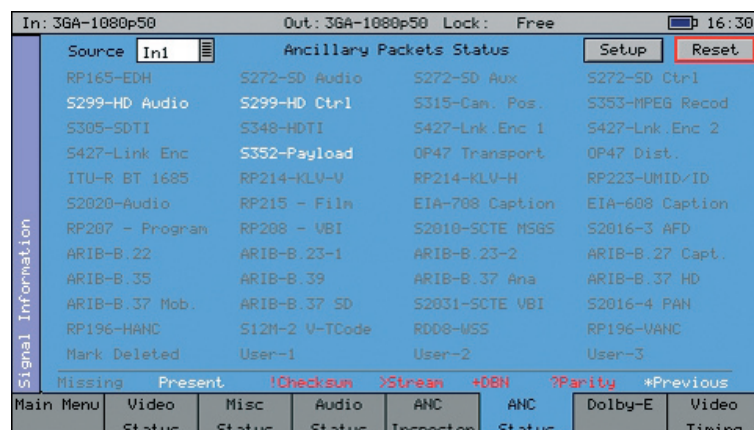
Remote setup and control of the SFP can be enabled via the web management settings, which include support for DHCP. Using Riedel MN SET control software to connect to your SFP further extends the configuration settings range available.

In 2110 modes, additional menus for PTP Precision Time Protocol), Audio flows, and Ancillary flows are also provided.

A **System → Engineer** menu, provides access to an IP-to-SDI and SDI-to-IP convertor, including a gateway feature (that will bypass the generator). In Encap mode this routes the signal on the SDI I/O connector – which is configured as an SDI input to the Sx TAG – to the input of the SFP. In Decap mode the output of the IP SFP is routed to the SDI I/O connector – which is configured as an SDI output.

Additional Core Sx Software Tools

Ancillary Packets Status

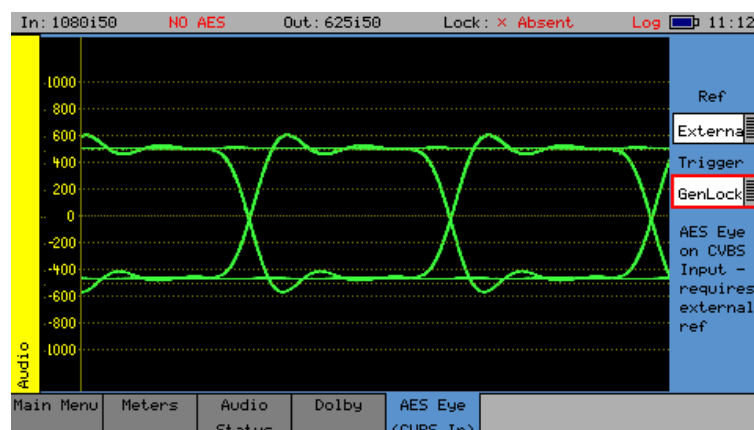


The Ancillary Packets Status tool provides broadcasters, studios, OB and broadcast manufacturers with a detailed analysis of the ancillary data present in an SDI signal.

A simple grid layout provides a quick overview of the available VANC/ANC ancillary data for an engineer. The packet type is then displayed as present, absent or red if in fault. Simple icons next to the packet indicate the fault. Each ancillary packet available from the grid view can be set to enable logging and then presented together with other information in the events window of the logging menu.

This tool further allows additional user-defined selections with the appropriate DID or SDID code. Any ancillary packet code can be saved down for future recall. Note that the Ancillary Packets Status tool does not fully decode the ancillary data but is used to identify whether the packet is present in the signal.

AES Eye

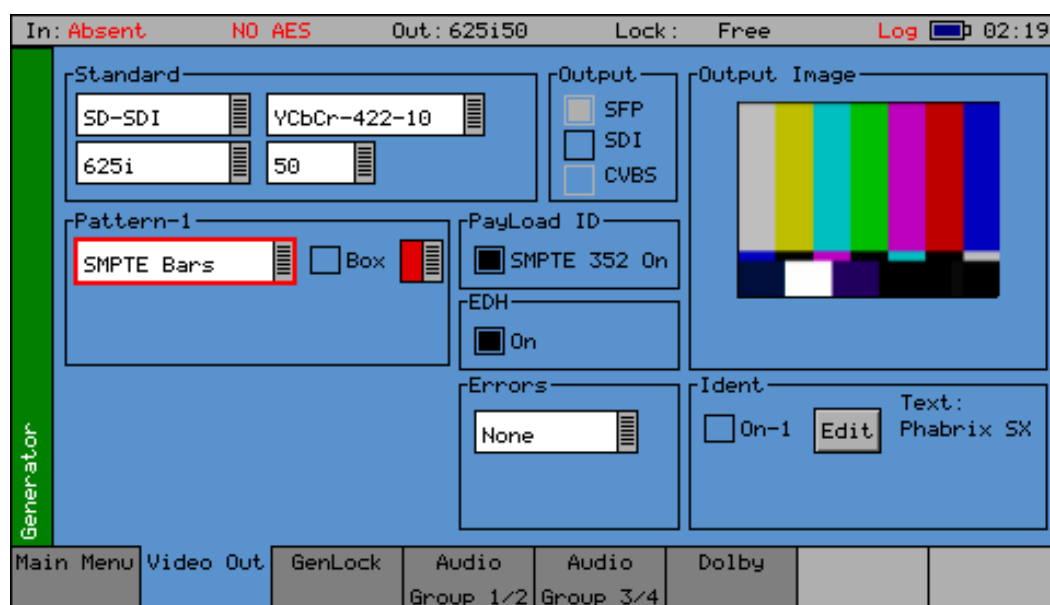


It can be difficult to check that the AES audio signal is correctly locked to the studio reference. The AES Eye instrument allows the AES waveform to be displayed on the unit. If the studio locking reference is also connected to the unit, then the AES Eye waveform can be displayed locked to this reference.

Menu Reference

Generator Menu

Video Out Menu (PHSXTAGC / PHSXO-GEN)



The Sx instrument can create video test signals for all supported SD-SDI, HD-SDI, 3G-SDI and 2K-SDI output standards including the 3 GHz standards at 1080p / 50 / 59 / 60. It will support Y,Cb,Cr, RGB and XYZ formats as well as RGB formats.

If the Sx TAG instrument has the Generator option (**PHSXO-GEN**) installed it can create video test signals for all supported SD and HD SDI output standards including the 3 GHz standards at 1080p / 50 / 59 / 60. It will support Y,Cb,Cr formats as well as RGB formats.

Output On

The Output On function turns ON the output circuitry.

Standard

The menus in the Standard section are used to select the desired video output format. The top-left box selects the basic mode of the Sx instrument and determines whether it is generating one of the following:

- **SD:** Standard definition video
- **HD:** High definition video
- **3G-A:** 3G level A video
- **3G-B:** 3G level B video
- **3G-B 2str:** 3G level B dual-stream video
- **3G-B 2str-2k:** 3G level B dual-stream 2k video
- **3GA-2k:** 3G level A 2k video

- **3GB-2k:** 3G level B 2k video
- **HD-2k:** High definition 2k video

Only valid frame rates for the output standard may be selected.

Color Format

- YCbCr 444 12 bit
- YCbCr 444 10 bit
- YCbCrA 4444 10 bit
- YCbCr 422 12 bit
- RGB 444 10 bit
- RGBA 4444 10 bit
- RGB 444 12 bit
- XYZ 444 12 bit

Output

The checkboxes in the Output section enable the output of the generated test pattern.

SFP:

Enables the SD, HD or 3G test pattern on a supported small form-factor pluggable device fitted in the SFP cage. If the option **PHSFP-10SR-IP SFP** is fitted, and the video standard is not supported, the Standard menu fields will turn red.

SDI:

Enables the SD, HD or 3G test pattern on the SDI I/O BNC connector, and turns off the SDI analyzer input.

CVBS:

Enables PAL (625i 50) or NTSC (525i 59) test patterns on the PAL/NTSC Out BNC connector.

Standard

The menus in the Standard section are used to select the desired video output format. The top-left box selects the basic mode of the Sx instrument and determines the video format to be generated from the choice of:

- SD-SDI
- HD-SDI
- 3G-Level A
- 3G-Level B
- SD-CVBS (PAL/NTSC).

When one of the SDI formats is selected only valid color formats and frame rates for the output standard may be selected.

When CVBS is selected, the menus in this section control the type of 625i and 525i line encoding of the generated Composite video output:

- PAL-I - 625i @ 50 fps with 4.433 MHz color subcarrier
- PAL-N 625i @ 50 fps with 3.582 MHz) color subcarrier

- PAL-N (ARG) - 625 @ 50 fps with 3.582 MHz color subcarrier
- PAL-M - 525i @ 59.95 fps with 3.575 MHz color subcarrier
- NTSC-M - 525i @ 59.95 fps with 3.579 MHz color subcarrier with 7.5 IRE setup
- NTSC-M (Jp) - 525i @ 59.95 fps with 3.579 MHz color subcarrier without setup

Color Format

For SDI formats the Sx TAG supports the YCbCr 4:2:2 10 bit color format as standard.

A 3G-SDI Advanced Video Formats option (**PHSXO-3GADV**) may be purchased to enable the following color formats. Note that the available color formats are dependent on the selected picture format and frame rate:

- YCbCr 444 12 bit
- YCbCr 444 10 bit
- YCbCrA 4444 10 bit
- YCbCr 422 12 bit
- RGB 444 10 bit
- RGBA 4444 10 bit
- RGB 444 12 bit
- XYZ 444 12 bit

2K-SDI Support

2K-SDI (Part of 3G-SDI Advanced Video Formats Option)

The Sx TAG 3G-SDI, Advanced formats and 2K Support option (**PHSXO-3GADV**) allows the generation and analysis of 2K video formats for YCbCr, RGB and XYZ color spaces.

XYZ Color Space:

A non-linear format that requires additional treatment by the Sx generator and analyzer circuitry to convert between linear and non-linear data formats. Only a limited number of non-linear test patterns are provided for XYZ as the traditional linear test patterns that are usually available in SD, HD and 3G are not applicable and will produce misleading results when analyzed.

100% Color Bars:

Generated in RGB color space and needs to be analyzed using the RGB color space selection in the Waveform monitor. This test pattern is provided to check the accuracy of the color paths through the equipment under test.

Legal Ramp:

Generated in XYZ non-linear format and needs to be analyzed using the X'Y'Z' color space selection in the Waveform monitor. This test pattern is provided to check the accuracy of the data path through the equipment under test.

Multiburst:

Generated in XYZ non-linear format and needs to be analyzed using the X'Y'Z' color space selection in the Waveform monitor. This test pattern is provided to check the frequency response and sample rate of the data passed through the equipment under test.

Color Field:

Produces fixed level colors in RGB color space that are converted to equivalent XYZ color space values and needs to be analyzed using the RGB color space selection in the Waveform monitor.

User File:

Allows user-defined test patterns that have been created in XYZ non-linear color space to be selected.

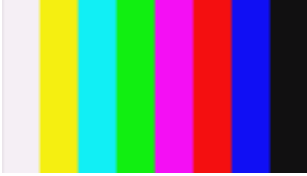









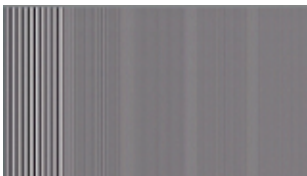









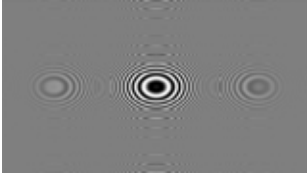
The XYZ, X, Y and Z settings in the Waveform monitor display the XYZ color space in its native non-linear form. So test patterns such as Legal Ramp will be displayed as curves instead of straight lines.

The X'Y'Z', X', Y', and Z' settings in the waveform monitor display the XYZ color space with a reverse transform to convert it to linear form, so test patterns such as Legal Ramp will be displayed as straight lines.

The Picture monitor and Vectorscope instruments will automatically apply the appropriate transforms to display the images in YCbCr, RGB and XYZ color spaces correctly. The color space transform to be applied is defined by the SMPTE 352 payload.

Pattern

This selects the video pattern that is output by the generator. Many standard patterns are provided by the Sx instrument. You may also upload your own test patterns to the Sx instrument into the **Patterns** directory and then select them using the **User File** option in this field. See the section [Sx File Structure](#) for a list of supported file formats.

			
100% Bars	75% Bars	75% Bars + Red	SMPTE Bars
			
Checkfield Pathological	EQ Test	PLL Test	Luma Ramp
			
Legal Ramp	Valid Ramps	Multiburst	Pluge
			
Bowtie	Tartan Bars	Grey Bars - 5	Grey Bars – 5-Vertical
			
Grey Bars - 11	Grey Bars – 11-Vertical	SMPTE 219/ARIB-28 Bars – 3 Variants	A/V Delay
	Black, Red, Green, Blue, Yellow, Cyan, Magenta, White, Custom Color Field	Downloadable files in bitmap(.bmp), 10bit DPX/YUV (.dpx, .yuv), Targa (.tga) and Phabrix .pat/.rgb/.yc4 compressed files User File	
Zone Plate			

If a User File has been selected, the **i** button beside the file can be selected to display information on the file properties. Unsupported file types will be displayed as a black image. If the video standard is

changed while a user file is loaded and there is no file for the new standard present, a black image will be loaded and the User File blanked.

Note: If Checkfield/Pathological is selected when a dual-stream format has been selected, *both* outputs will be forced to checkfield due to internal hardware limitations. If another pattern is selected, the Checkfield pattern will be de-selected. The exceptions to this are when Color Field or Zone Plate are selected as test patterns.

The available patterns (Checkfield, Pathological, PLL Check, EQ Check, etc.) will only look like the following picture(s) when a YCbCr 422 10 bit color mode is selected. Other color modes will have different pictures but still create the SDI datastream required by SMPTE. A bouncing box may be overlaid on the current test pattern by selecting the **Box** checkbox.

AV Delay:

The AV Delay Test pattern and associated audio pulse provided by the Generator module can be used to check the differential delay between video and audio. This animated test pattern provides a constantly moving clapperboard and the corresponding AV Delay Audio pulse and video white line flash when the clapperboard reaches the center of the test pattern.

Color Field:

If color field is the selected test pattern, another control selects which color to generate. Three user definable custom colors may be defined using the -> button. Custom colors are edited using the Red-Green-Blue sliders. When setting the color using the RGB sliders, the YCbCr values will show the values for the current color space. When setting the color using the YCbCr sliders, the RGB values will show the values for the current color space.

Zone Plate:

The following zone plate pattern is supplied as standard with all Sx instruments.

Moving Zone-2H:

A moving zone plate pattern, centered on the screen.

Programmable Zone Plate Generator (Option: PHSXOZ)

An optional, programmable, zone plate generator (**PHSXOZ**) is available for all Sx instruments. The zone plate selector contains several preconfigured zone plates, together with three user-customizable zone plates. Pressing the -> button to the right of the selected zone plate name displays the **Zone Plate Edit** dialog which allows the parameters of the zone plate to be adjusted for the custom zone plates. Any of the preset zone plates may be copied to the custom zone plates to act as a starting point for a new zone plate. As the zone plate settings are stored in user memories, many custom zone plates are available for use. The following additional zone plates are provided with Zone Plate option PHSXOZ:

Static Zone-2H:

A static zone plate centered on the screen from DC to the Nyquist frequency at left/right edges.

Static Zone-2V:

A static zone plate centered on the screen from DC to the Nyquist frequency at top/bottom edges.

Sweep-Horiz:

A horizontal sweep from DC to Nyquist frequency horizontally.

Sweep-Vert:

A vertical sweep from DC vertically.

Grating-50kHz:

A 50 kHz frequency sine wave when using an HD output.

Grating-1MHz@HD:

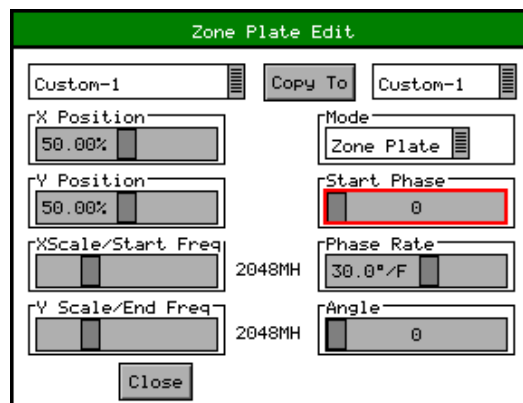
A 1 MHz frequency sine wave when using an HD output.

Grating-5MHz@HD:

A 5 MHz frequency sine wave when using an HD output

Custom-1 through Custom-3:

This allows editing of Custom zone plate settings. Three custom zone plates can be set up and can be copied from an existing preset using the **Copy To** button.

**Mode:**

Sets which type of Zone Plate is being produced. It may be Zone Plate (circular pattern) Grating (Linear horizontal or vertical grid) Sweep (Frequency sweeps from start to end Frequency)

Start Phase:

Sets the start phase of the sine wave generated by the zone plate generator and is set in degrees from 0 to 360.

Phase Rate

Sets the rate of change of phase of the sine wave, consequently changing the speed at which the zone plate moves. Phase rate is specified in degrees per frame.

Angle:

Changes the angle of the zone plate, which can change a horizontal sweep into a vertical sweep or rotate an elliptical zone plate pattern.

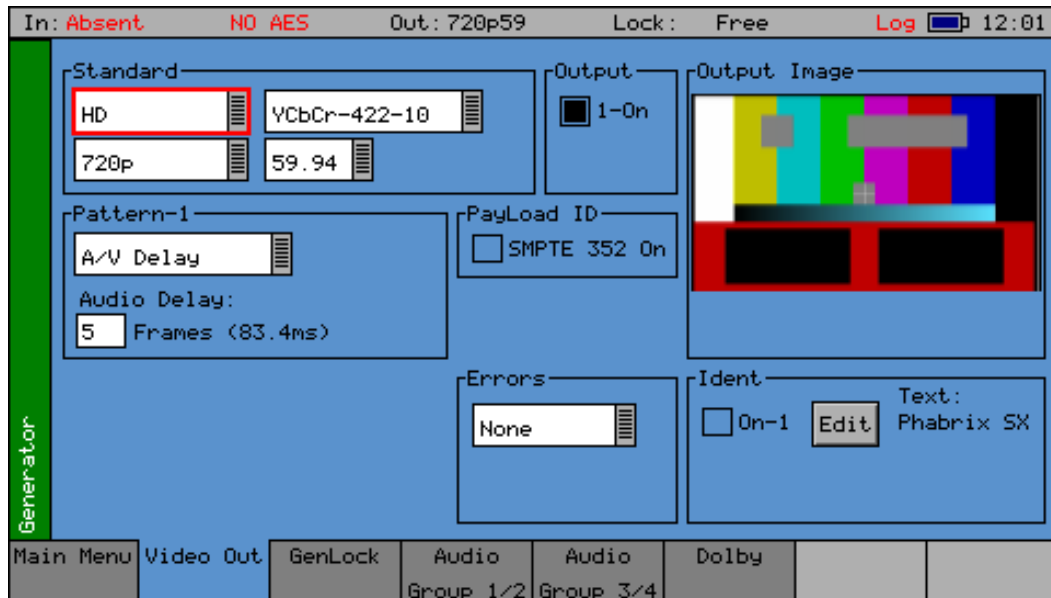
XScale/Start Freq:

Sets the horizontal scale of grating patterns or the start value of the zone plate sweep frequency.

YScale/End Freq:

Sets the vertical scale of grating patterns or the end value of the zone plate sweep frequency.

AV Delay Generator



The AV Delay Generator produces an adapted EBU Tech 3305 AV Sync *clapperboard* Test Pattern. An audio delay offset with respect to video of up to +/- 40 frames can be applied in increments of one frame.

The AV Delay test pattern and audio pulse provided by the Generator module can be used to measure the differential delay between the video and audio paths in a piece of equipment or an SDI or AES based system.

In the **Video Out** menu page, the AV Delay test pattern and **Audio Delay** offset can be selected.

In the **Audio Group** menu pages, the AV delay audio pulse can be inserted on up to 16 embedded SDI audio channels, plus AES out.

Note: The AV Delay signal is compatible with third party AV delay analyzers such as the LAWO V_pro8.

The AV Delay Generator creates an adapted EBU Tech 3305 AV Sync pattern. This provides a constantly moving *clapperboard* which, when it closes, shows a vertical white *flash* line for one frame with a corresponding audio pulse.

To access the AV Delay Generator option:

- Select **A/V Delay** in the **Pattern** dropdown menu
AV Delay can be used with all Sx supported video formats and frame rates on SDI and AES interfaces.
An **Audio Delay** field is then displayed.

Using the **Audio Delay** field, you can offset the timing of the generated audio pulse relative to the central white flash frame of the test pattern. An audio delay offset of up to +/- 40 frames can be applied in increments of one frame. The delay value in milliseconds is displayed alongside the frame delay value.

- When **Audio Delay** is set to a positive (+) value, the audio pulse will lag the video
- When **Audio Delay** is set to a negative (-) value, the audio pulse will be ahead of the video.

The audio delay offset has several applications:

1. The differential delay of a system or device under test can be quickly measured in TV frames by adjusting the Audio Delay offset until the measurement reads less than a TV Frame. This can

quickly confirm that the differential AV delay is an integer number of TV frames

2. The analyzer can measure AV differential delay up to ± 400 ms. If the system under test has a propagation delay longer than this, setting an offset of up to -40 frames extends the overall measurement window.

On the AV Delay analyzer, a measured delay amount that is not accounted for by the generated Audio Delay offset, will indicate delay introduced by the system under test.

To choose the AV Delay pulse audio channels, go to the **Generator → Audio Group [1/2] [3/4]** menu pages, and select **AV Delay** in the dropdown menu for each audio channel as required.

EDH

If the output signal is SD (PAL-625 or NTSC-525) the insertion of EDH information may be switched on or off.

Errors

This field enables the insertion of CRC or EDH errors into the video signal. This allows checking of third-party error detection circuitry. In SD, there is one EDH ancillary packet per field. When errors are being inserted every EDH value is deliberately corrupted, creating one error count per field or, more precisely, one AP error and one FF error. In HD, a CRC value is calculated for each line. When errors are being inserted the CRC value on line number 1 is deliberately corrupted. This creates one CRC error count per frame. There is also the option to generate CRC errors (not SD EDH errors) on only the switching line in field 1 which can be used to check that any downstream equipment ignores errors on switching lines.

SMPTE 352

This checkbox allows the SMPTE 352 Payload ID field to be inserted into the video output stream. The state of this checkbox is stored separately for SD, HD and HD-3G line standards.

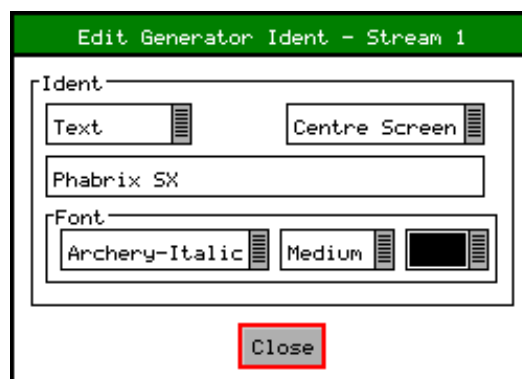
Note: For all HD-3G line standards the Payload ID should be switched **on**.

Ident

A picture or text *Ident* may be set to identify an SDI source. This Ident can be switched on or off from this page but any changes to the text, font, or bitmap are made in the **Ident** dialog by selecting the **Edit** button. An overview of the Ident can be seen beside the **Edit** button.

Note: If Zone Plate or Color Field patterns are selected, text cannot be overlaid on them.

A thumbnail version of the video output signal is displayed on this page with any overlaid Ident.

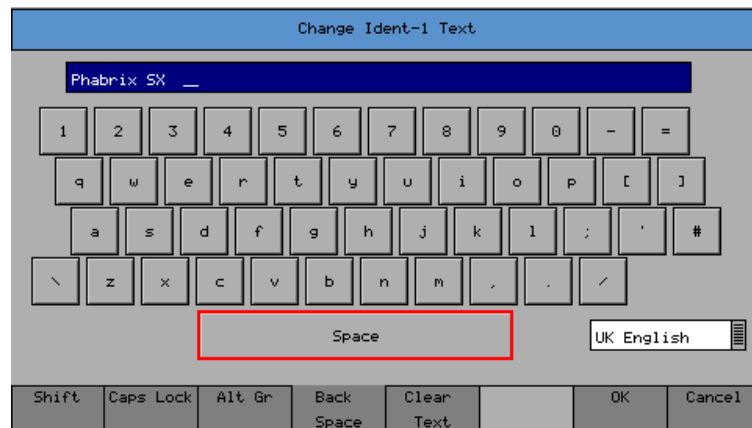


The **Edit Generator Ident** dialog allows selection of either a user-defined bitmap picture, downloaded into the **Idents** directory of the Sx instrument or user-defined text.

For both types, the position of the ident on the screen can be set to one of the following:

- Top-Left
- Top-Center
- Top-Right
- Left-Center
- Center-Screen
- Right Center
- Bottom-Left
- Bottom-Center
- Bottom-Right

When text ident is used, the font, font size and color can be specified. Several fonts are included with the Sx instrument and other true-type (.ttf) fonts may be downloaded as required.

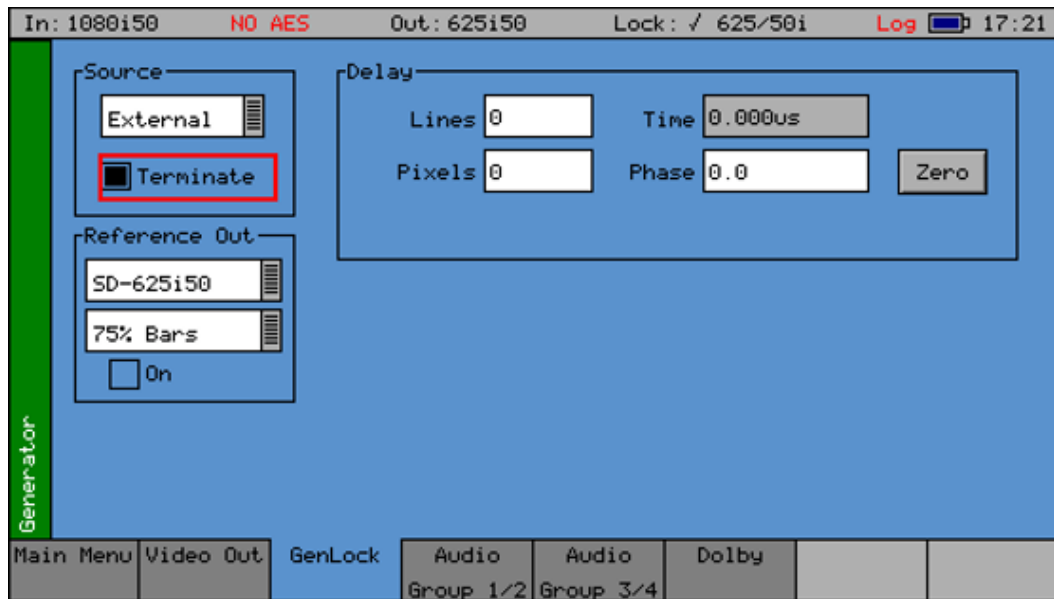


When editing text, the keyboard above is displayed to allow easy editing. Move the cursor to select the key to use and then press **Ok** to *press* it. The **Shift** menu key causes the keyboard to change to shift mode for the next key.

The **Caps Lock** key locks the keyboard in all upper-case mode. The **Alt Gr** key shows any language dependent alternate keys that may be pressed. Several country keyboard styles are provided.

Note: Some fonts do not support all non-English characters.

Genlock Menu



The Sx instrument can create video test signals that are either free-running or locked to a studio reference signal.

The Genlock menu is used to select an external locking reference or set the instrument to free run.

Source

The unit may be locked to:

External:

An external locking reference connected to the Ref I/O connector, such as a studio reference, which can either be black & burst or a Tri-Level sync

Input 1:

The SDI video input present on the SDI I/O connector.

CVBS In:

The Composite video input present on the PAL/NTSC (AES Eye) connector.

Free-Run:

The unit can operate using its own internal SPG.

Note that the **On** checkbox in the **Reference Out** section controls whether the *External* source is actually from an externally connected source or from an internally generated source.

Reference Out

The Sx TAG can either accept an external locking reference signal or create a black & burst reference output for PAL (SD-625i50) or NTSC (SD-525i59). The dropdown menu box allows the selection of either **SD-625i50** or **SD-525i59**, and the **On** checkbox, when selected, changes the REF I/O connection from input to output.

The Reference output signal can either be black & burst or 75% color bars.

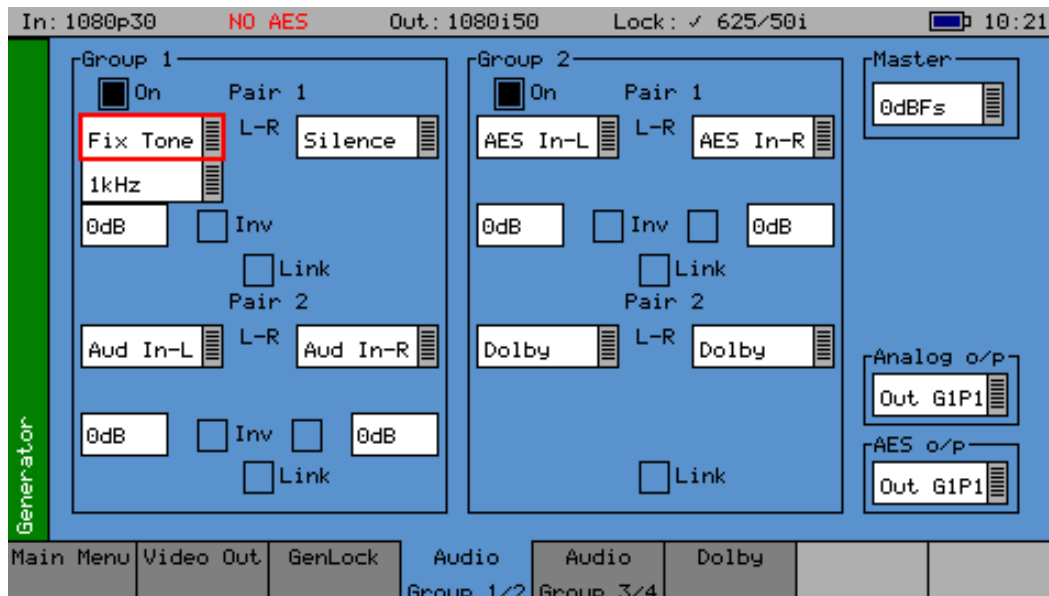
Delay

The Composite and SDI output generated by the unit can be advanced/delayed with respect to the currently selected locking reference. Controls are provided for line and pixel advance/delay for Composite and SDI output. For composite output the Phase control allows the subcarrier phase of the PAL/NTSC composite output to be adjusted with respect to the reference burst phase of the External locking reference black & burst signal.

Note that due to the difference in position of the synchronization pulse of the Composite video output compared to the equivalent SD-SDI synchronization pulse, there is a difference of 17 pixels. If the SD-SDI output needs to be exactly matched to the locking reference, then a value of **0** needs to be entered in the **Pixels** field. If, however, the composite output needs to be matched to the reference then a value of **-17** should be entered in the **Pixels** field.

The Zero button is used to set the menu value for Phase back to zero once the exact subcarrier phase of the composite output has been setup for the currently selected locking reference signal. This can be used when comparative phase measurements are being made between the input and output of any equipment under test.

Audio Group Menu



The Sx instrument can embed an audio signal on all 16 embedded audio outputs.

The Audio Group menu controls which audio channels, pairs or groups have test tones applied and the type of tone.

Group n

Each of the four groups may be separately enabled. When enabled, the source and level of each channel in a pair can be selected.

Source

The source for each channel may be Silence, Fixed tone (a range of fixed frequencies), variable tone (where the frequency can be set on 1 Hz steps from 1 Hz to 23.99 kHz), white noise, or AV Delay. If the Dolby Generation option has been purchased, the source may be set to **Dolby** at which time the other channel in the audio pair is also set to **Dolby** and gain control is disabled.

AV Delay Audio Pulse

For AV Delay audio pulse generation, choose which audio channel should carry the AV Delay pulse, and then set the source to **AV Delay** in the dropdown menu. Make sure that the **Group** checkbox for this channel is also enabled.

The AV delay audio pulse can be inserted on up to 16 embedded SDI audio channels.

If an Audio Delay offset is required for the generated AV Delay pulse, this can be set in the **Generator** → **Video Out** page after selecting the **A/V Delay** test pattern. An offset of up to +/- 40 frames can be applied in increments of one frame.

Inv (Invert)

This checkbox phase-inverts the audio signal to allow checking of third-party audio mixing.

Link

This checkbox links the left and right channels of a pair so that changing the level on the left-hand channel also changes the level on the right-hand channel.

Master

The Master level sets the 0 dB level for all the embedded audio channels, so if the Master level is set to -18 dB and Group 1 Pair 1 output is set to -2 dB, the actual level output on that pair is -20 dB. This feature allows all embedded outputs to be adjusted together, as well as giving a simple method to change from -18 dB to -20 dB based standard levels.

AES O/P

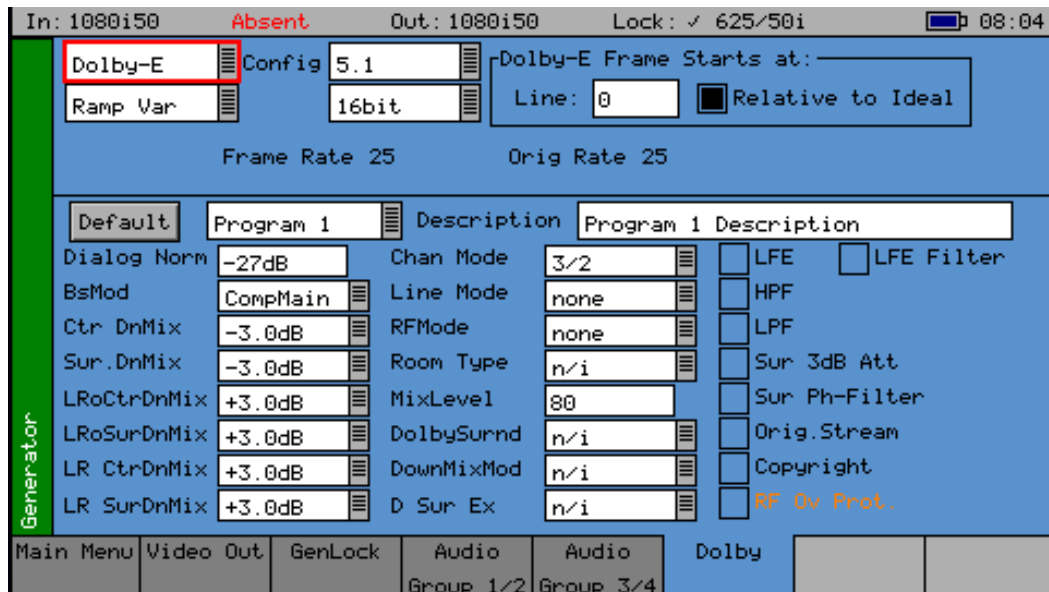
The **AES o/p** (output) control selects the source for the AES output of the Sx instrument and can be:

- The AES input (through the built-in sample rate converter) to convert to 48 kHz sample rate AES signals.
- A mirrored output of the specified embedded AES stream contained in the SDI output to generate audio tones or white noise.
- One of the embedded input pairs on the SDI input to allow use as a de-embedder.
- Off, if the output is not required.

Note that the AES output is always at a 48 kHz sample rate. The AES input includes a sample rate convertor and so will accept any sample rate between 32 kHz and 192 kHz.

The AES audio output is available via the Audio I/O connector.

Dolby (Dolby Generator Option: PHSXO-DAG)



The Sx instrument Dolby Generator software option (**PHSXO-DAG**) allows the generation of Dolby E, Dolby Digital and Dolby Digital Plus pre-encoded test signals to check that they are transferred transparently through the broadcast chain unaffected by routers/switchers, satellite links, etc.

The Audio - Dolby menu controls the generation of Dolby test data.

Overview

There are several Dolby broadcast digital audio standards that transport audio data over an SMPTE 337M AES carrier with a 48 kHz sample rate. The type of Dolby to be generated can be selected from the dropdown list in the top left corner of the menu:

- Dolby E
- Dolby Digital
- Dolby Digital Plus

These standards can be used to transport mono, stereo, 5.1 and 7.1 audio programs:

Dolby 5.1:

Involves five channels for normal-range speakers (20 Hz – 20,000 Hz) (right front, center, left front, rear right, rear left) and one channel (20 Hz – 120 Hz allotted audio) for the sub-woofer driven low-frequency effects.

Dolby 7.1:

Uses six channels in the primary program (Independent Substream) for a standard 5.1 surround sound mix and then the remaining two channels in an ancillary program (Dependent Substream) to provide the additional down-mix.

Dolby E

Dolby E is an audio encoding and decoding technology developed by Dolby Laboratories that allows up to 8 channels of audio (mono, stereo, 5.1 or 7.1) for a primary program (Program 1) and optional ancillary programs. These eight channels are compressed (lossless) into a digital stream that can be transferred between compatible devices and stored on a standard stereo pair of audio tracks. The most elaborate mode in common use is Dolby 7.1 which uses all eight channels to provide surround sound.

Dolby Digital

Dolby Digital (AC-3) is a *perceptual audio* system for digital audio that allows the reduction of data needs to deliver high-quality sound. This system was developed primarily for DTV, DVD and HDTV. This format allows up to six channels of sound (mono, stereo or 5.1) in the form of a single *program* that can be delivered at different bit rates. These six channels are compressed (lossy) into a digital stream that can be broadcast. The most elaborate mode in common use is Dolby 5.1 which uses all six channels to provide surround sound.

Dolby Digital Plus

Dolby Digital Plus (E-AC-3) is a more advanced version of Dolby Digital that provides a more efficient encoding algorithm offering a primary program and optional ancillary programs. These can be optionally delivered at lower bit rates than Dolby Digital.

Dolby E Synchronization - Generator Reference

The Dolby audio test signal produced by the Sx instrument is affected by a reference signal connected to the Sx instrument and by the following settings:

Free Run:

If the generator is not locked to reference, the Dolby signal will be generated synchronous to the generator. If the generator is running at a fast progressive rate (50 - 60 fps) it will generate packets on every other frame.

External Reference / Ext SDI Reference:

If the generator is locked to an external signal, the reference signal *must* be of an appropriate standard. See the table below for examples.

Video Output Format	Valid Reference Formats
1080i50	1080i50, 625i50(PAL)
1080i59	1080i59, 525i59(NTSC)
1080p25	1080p25, 1080i50, 625i50(PAL)
1080p29	1080p29, 1080i59, 525i59(NTSC)
720p50	1080p25, 720p25, 1080i50, 625i50(PAL) – due to length of packet being over one frame long
720p59	1080p29, 720p29, 1080i59, 525i59(NTSC) – due to length of packet being over one frame long
1080p50	1080p25, 720p25, 1080i50, 625i50(PAL) – due to length of packet being over one frame long
1080p59	1080p29, 720p29, 1080i59, 525i59(NTSC) – due to length of packet being over one frame long

Editing Program Information

Stream type:

Only Dolby E streams can be generated with this software version.

Config, Bit Depth:

The program configuration and Bit Depth can be changed to load the pre-encoded file.

Stream contents:

The tones generated are of a fixed predefined frequency. Four sets of pre-encoded streams are provided:

Ramp Var:

Each channel has a different frequency to allow checking of channels. The levels are ramped so that different channels have different levels.

–3dB Fixed:

All the tones are at –3 dB co-phased/timed and are at the same frequency.

–18dB Fixed:

All the tones are at –3 dB co-phased/timed and are at the same frequency.

–20dB Fixed:

All the tones are at –3 dB co-phased/timed and are at the same frequency.

Fixed Frequency values for Fixed level streams above:

Frame Rate	Normal Frequency	LFE Frequency
23.98	4.8 kHz	211 Hz
24	6 kHz	240 Hz
25 / 50	6 kHz	240 Hz
29.97 / 59.84	6 kHz	133 Hz
30 / 60	6 kHz	240 Hz

Dolby E Start Line:

The start line can be used to set valid or invalid ranges to allow checking of the Dolby E guard band on downstream equipment. If the start line is set outside the valid range specified by Dolby, the line number will be displayed in red.

Relative to Ideal:

If this checkbox is checked, the line number displayed is relative to the Dolby specified ideal line. A value of **0** therefore starts the Dolby E packet on the *Ideal Line* for that video format.

Frame Rate:

This is set by default to the currently generated frame rate but may be modified by the user to test downstream equipment.

Original Rate:

This is set by default to the currently generated frame rate but may be modified by the user to test downstream equipment.

Note: When generating a progressive fast rate video standard such as 720p50, 720p59 or 720p60 etc., the Dolby E signal will always be generated at the related slower rate. This is a Dolby restriction as the packets are over one frame in length for these video formats.

Program Metadata Editing

Many of the metadata fields may be edited to test downstream equipment. The Channel Mode field may be edited to invalid settings but they will be shown in red to show that they are invalid. The settings currently being edited are for the selected program, but multiple program metadata values can be modified and the settings for all programs are stored in memories.

Metadata changes and line changes will happen cleanly so that no corruption to the Dolby signal will occur.

A maximum of 30 characters may be used for program description text. If the text is longer than this, extra characters will be ignored.

The **Generator → Dolby** menu allows the metadata for a Dolby E datastream to be setup for testing purposes. The main purpose of setting these metadata fields is to check that they are transferred transparently through the broadcast chain unaffected by routers/switchers, satellite links, etc. For any program this metadata would be created as part of Dolby E authoring process. Using the Dolby generator, the following metadata can be setup for Program 1:

Dialog Norm:

The normal audio level for dialog. Ideally all transmitted programs would have the same value.

BsMod:

Bitstream Mode indicates the type of audio service that the bitstream contains. Complete Main (CM) is the standard mode of operation and contains a complete audio program including dialog, music, and effects.

Ctr DnMix:

Center down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

Sur DnMix:

Surround down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

LROctrDnMix:

Left / right / stereo / center down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 7.1 Dependent Substream.

LROsurDnMix:

Left / right / stereo / surround down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 7.1 Dependent Substream.

LR CtrDnMix:

Left / right / center down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

LR SurDnMix:

Left / right / surround down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

Chan Mode:

Defines the channel configuration for Program 1 (i.e., mono, stereo, 5.1 channels).

Line Mode:

An Operational Mode / Dynamic Compression Mode used by consumer and professional decoder products to simplify the implementation of Dialog Normalization, Dynamic Range Control, and down-mixing functions, all of which are necessary in Dolby Digital products.

RFMode:

An Operational Mode / Dynamic Compression Mode used by consumer and professional decoder products to simplify the implementation of Dialog Normalization, Dynamic Range Control, and down-mixing functions, all of which are necessary in Dolby Digital products.

Room Type:

Information parameter that indicates the type and calibration of the mixing room used for the final audio mixing session.

MixLevel:

The Surround Down-mix Level parameter indicates the nominal Lo/Ro down-mix level of the Surround channel(s) with respect to the Left and Right channels.

DolbySurnd:

The Dolby Surround Mode parameter indicates whether a two-channel Dolby Digital bit-stream is conveying a Dolby Surround encoded program.

DownMixMod:

Controls the Down Mix Mode which is used by the content creator to optimize Center and Surround channel levels for use in stereo down-mix mode for any two-channel programs.

DSurEx:

Controls the Dolby Surround Ex channel that provides an extra audio channel for Dolby 5.1. The extra surround channel of the Dolby Surround Ex system is matrix-encoded onto the discrete left-surround and right-surround channels of the 5.1 mix.

The following control bits can also be set by selecting the corresponding checkbox(es):

LFE:

The LFE Channel parameter enables or disables the Low-Frequency Effects (LFE) channel.

HPF:

This parameter can be used to activate the DC High pass filter for all input channels.

LPF:

The LFE Low Pass Filter parameter can be used to activate a 120 Hz low-pass filter applied to the LFE input channel.

Sur 3dB Alt:

The Surround Channel 3 dB Attenuation function is used to apply a 3 dB attenuation to the Surround channels of a multichannel soundtrack created in a room with film style calibration, when encoding it for consumer home theater playback.

Sur Ph-Filter:

The Surround Channel 90-Degree Phase-Shift feature is used for generating multichannel Dolby Digital bitstreams that can be down-mixed in an external two channel decoder to create a true Dolby Surround compatible output.

Orig. Stream:

The Original Bitstream informational parameter sets the value of a single bit within the Dolby Digital bitstream. This bit has a value of 1 (box checked) if the bitstream is an original. If it is a copy of an original bitstream, it has a value of 0.

Copyright:

The Copyright Bit informational parameter sets the value of a single bit within the Dolby Digital bitstream. If this bit has a value of 1 (box checked), the information in the bitstream is indicated as protected by copyright. If it has a value of 0, it is not copyright protected.

RF Ov Prot.:

The RF Over-modulation Protection parameter determines whether an RF pre-emphasis filter is used in the overload protection algorithm to prevent RF over-modulation in set-top box decoders.

Default Program Metadata

Pressing the **Default** button will return program metadata settings to their default values.

Embedding Dolby on SDI Stream

To embed Dolby signals on an SDI stream, the Audio source for that channel should be set to **Dolby**. These source selections are found on the **Generator → Audio Group [1/2 [3/4]** pages. Setting one channel of an audio pair to **Dolby** automatically forces the other channel in the pair to select **Dolby**. As the Dolby streams are data, the volume and phase controls are disabled. Changing a channel from Dolby to another source will cause the other channel in the pair to select silence.

Embedding Dolby Signals on AES Stream

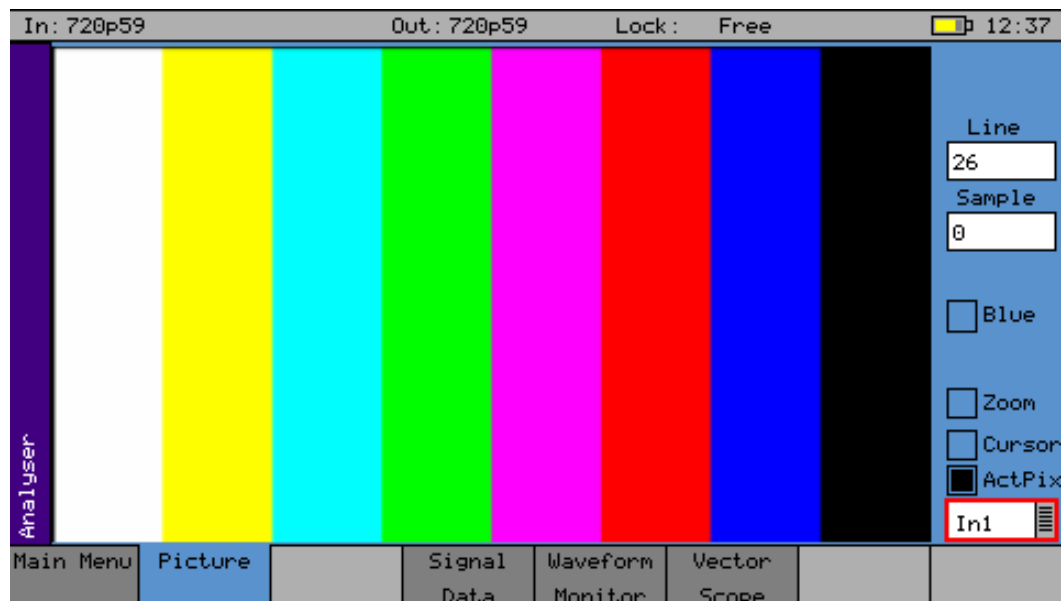
To embed Dolby signals on the AES output, the Audio source for the **AES o/p** (AES output) should be set to **Dolby**. This field is located at the bottom-right of the **Generator → Audio Group [1/2 [3/4]** pages.

Analyzer Menu

Overview

The Sx instrument signal analyzer displays the selected video input or output signal. The source for the analyzer is set by the field at the bottom right of the page. The current line and sample are the same for all pages of the analyzer and therefore when selecting a sample on the Signal Data page, the cursor will show where that is on the *Full Picture* page.

Picture



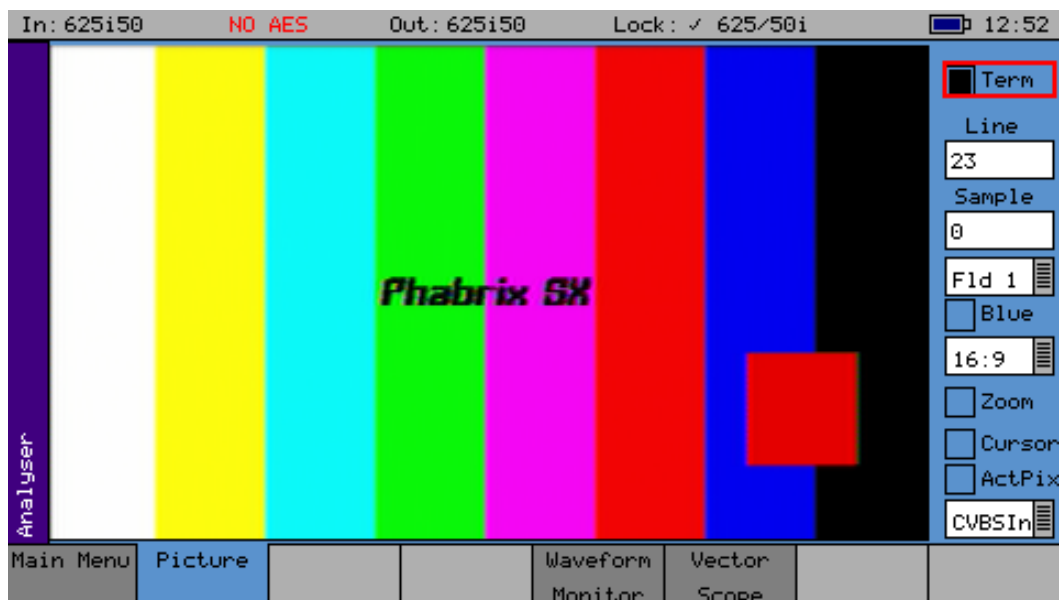
With **Picture** selected, the video picture is displayed in a window as a down-converted display.

If the picture window is selected and current tab button is pressed again to enter full-screen mode, the cursors may be moved by pressing the **OK** button again.

The Picture monitor will automatically apply the appropriate transforms to display the images in YCbCr, RGB and XYZ color spaces correctly. The color space transform to be applied is defined by the SMPTE 352 payload.

Analyzer Source Selection

The Picture monitor can display the Composite input, the SDI input, the SFP video input or the generator test pattern. Select using the dropdown menu in the bottom-right corner of the menu.



The displayed options will be different depending on whether SDI or Composite video is being displayed.

Sample, Line and Field Selection

Sample:

Specify the current sample for analysis.

Line:

Specify the current line for analysis.

Field:

Only used for Interlaced formats. Selects the field for analysis. If the current line is in Field 1, changing the field will change to the same line in Field 2. The field number will change to show the correct field for the current line number.

The picture will automatically view the horizontal or vertical blanking areas if the line or sample values are in the blanking area.

Aspect Ratio

The aspect ratio of PAL (625 lines) may be set to be either 4:3 or 16:9 as required for the source signal. NTSC (525) signals are always 4:3 aspect ratio and HD signals are always 16:9.

Zoom

If the Zoom checkbox is not checked, the picture displayed is a down-converted picture to fill the window or the full screen as requested. If checked, then a pixel on the LCD display will reflect a pixel in the video signal. In zoom mode, no filtering is used.

Cursor

A cross-hair cursor may be activated over the area of the picture defined by the specified line and sample.

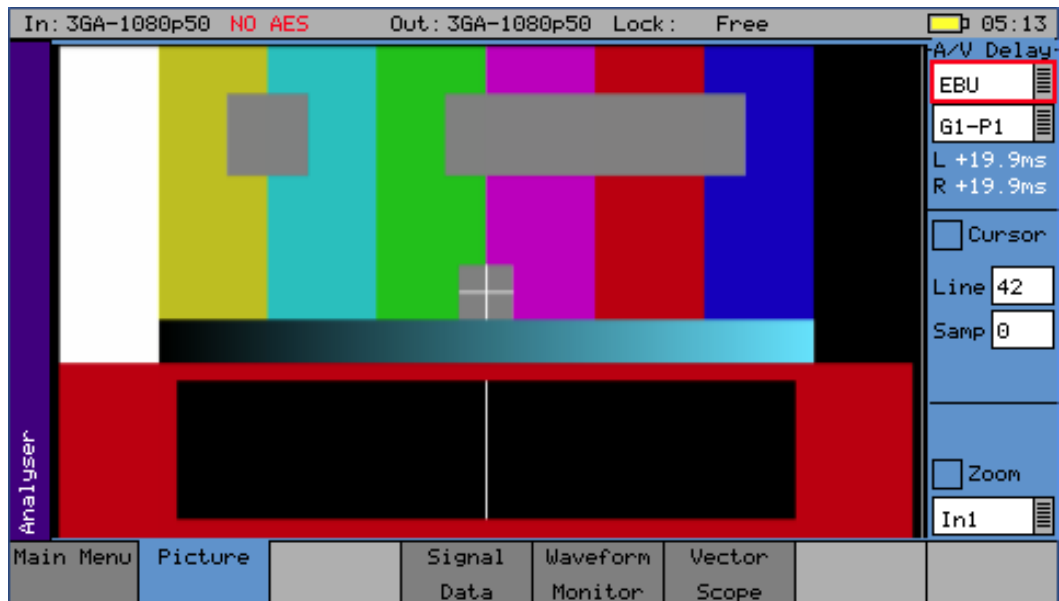
If the focus cursor is moved to the picture window and **OK** pressed, the cursor may be used to scroll around the window. Press **OK** again to cancel this mode. When in zoom mode, the cursor is always in the center of the window and the picture scrolls behind it. If the cursor is moved to an area of interest on the picture, the same area will be displayed in the **Analyser → Signal Data** view, if an option (**PHSXOSD**) is purchased.

Note: The standard cursor menu keys may be used but are not visible. Press **OK** again to cancel cursor adjustment mode.

Composite Input Termination

The **Term** checkbox, present when composite video is displayed, is used to terminate the composite video input. Un-terminating the composite input can be useful if the signal being monitored is terminated at the end of the cable run.

AV Delay Analyzer (AV Delay Option: PHSXO-AVD)



AV Delay measurement is available in the Picture instrument.

Measurement of two AV Delay test patterns is supported:

- EBU Tech 3305
- LAWO V_line AV Sync test pattern

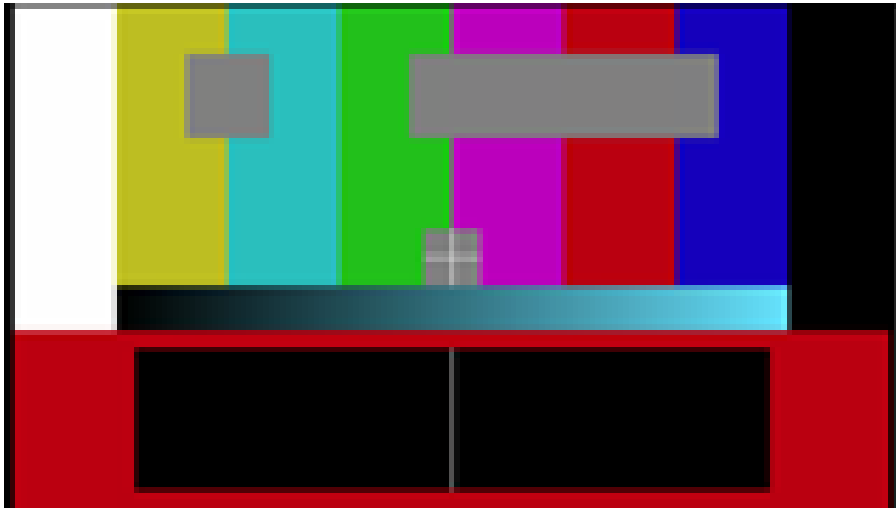
The tool provides a real-time update of the differential delay between the video and the selected audio channel pair.

When analyzing an AV delay video test pattern and audio pulse, the differential delay between the video and the selected audio channel pair will be measured and displayed – with the display updated in real-time.

- A positive (+) measurement indicates that the audio pulse is lagging behind the video
- A negative (-) measurement indicates that the audio pulse is ahead of the video
- When video and audio are completely in sync, zero delay will be measured.

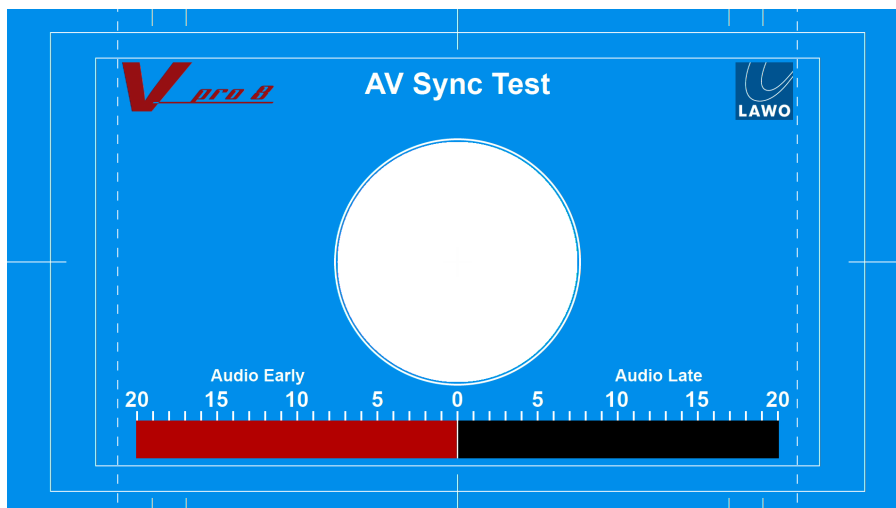
The differential delay between the video and the selected audio is measured in 0.1 ms steps (to an accuracy of 1 ms) with an operating range of +/-400 ms.

An Audio Delay offset can be applied to an Sx generated AV delay test pattern using the **Generator → Video Out** page. In the AV Delay analyzer, any delay amount that is not accounted for by the generated **Audio Delay** offset, will indicate delay introduced by the system under test.



The Sx modified EBU Tech 3305 AV Sync test pattern provides a constantly moving clapperboard that when it closes shows a vertical white flash line for one frame.

When video and audio are in sync, the audio pulse will sound at the exact moment the white flash appears. If video and audio are out of sync, there will be a differential delay between the timing of these two events.



The LAWO V_line AV Sync test pattern provides a constantly moving progress bar. When the progress bar reaches the center frame of the test pattern, first a vertical white bar then a white flash appears in the center circle.

When video and audio are in sync, the audio pulse should sound at the exact moment the white flash appears. When video and audio are out of sync, there will be a differential delay between the timing of these two events.

To measure AV Delay in the **Picture** instrument, the Picture source should be set to the SDI input to analyze the incoming video signal.

Note: The Picture source can also be set to view the generator output.

The **A/V Delay** selection menus and measurements display is located in the top right-hand corner of the Picture instrument.

To measure the differential AV Delay, first ensure that a suitable test source is being used.

For the AV Delay measurement to be valid, the measuring Sx unit must be genlocked to a suitable reference, defined as either of the following:

- the SDI input being analyzed
- the external reference to which the AV Delay test signal source device is locked.

If, however, the measuring Sx is also the source device generating the AV Delay test signal in a loop, then a suitable reference is defined as either of the following:

- External reference
- Free run

Trying to lock the Sx unit to its own input signal is not valid.

The Sx unit reference input can be set in the **Generator → GenLock** page.

Switch on AV Delay measurement by selecting the appropriate test pattern type from the first **A/V Delay** dropdown menu:

- Select either: OFF, EBU, LAWO

In the next dropdown menu, select the required audio group and pair carrying the AV delay audio pulse – the timing of which will be measured relative to the video test pattern.

The AV Delay pulse can be carried on either an embedded SDI audio or AES channel:

- AES In, G1-P1, G1-P2, G2-P1, G2-P2, G3-P1, G3-P2, G4-P1, G4-P2

The Left (L) and Right (R) channel fields will display any measured differential delay between the video and that audio channel in milliseconds (ms).

The status of the AV delay measurement tool (when switched on) is shown by the color of the measurement display fields:

Yellow

Sampling in preparation for A/V Delay measurement. Not accurate during this period.

White

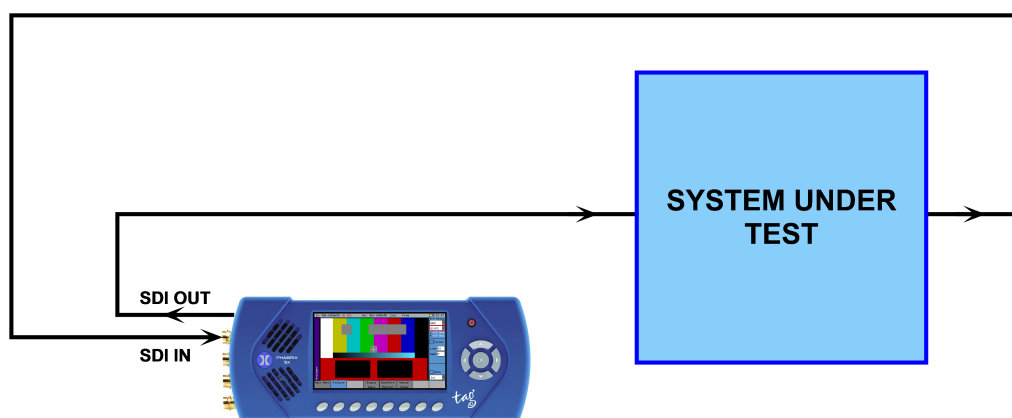
Measured differential delay. No errors detected.

Red

The correct AV delay pattern has not been detected and/or no AV delay pulse has been detected

Audio-to-Video Differential Delay Testing:

Objective: To measure the imposed differential delay of the audio and video paths in the system under test.



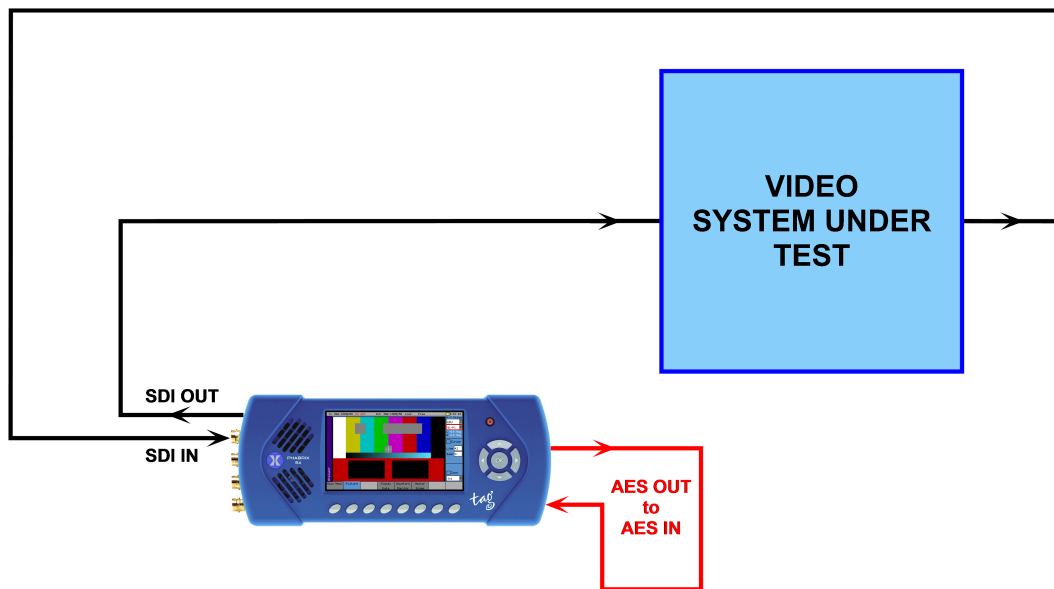
- Use an SDI SFP for SDI output or input, for example, the SDI HD BNC SFP module (order code: **PHSFP-RT30-HDBNC**).
- Audio pulse carried on embedded SDI channel pair
- Genlock to external reference or free run

Propagation Delay Testing (of either video or audio):

Objective: Measure the propagation delay imposed on the video or audio by the system under test.

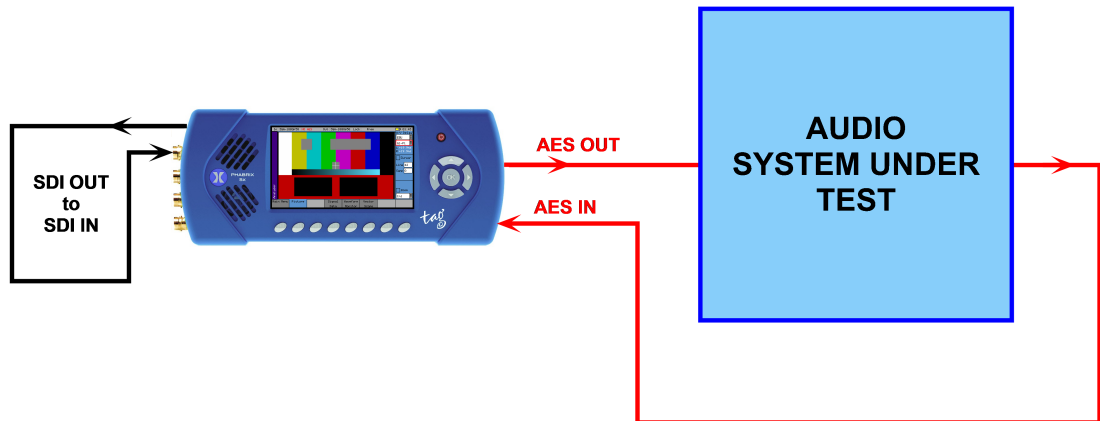
Note: The analyzer can measure delay up to ± 400 ms. If the system under test has a delay longer than this, setting an Audio Delay offset of up to -40 frames will extend the analysis window.

Video Propagation Delay Testing:



- Use an SDI SFP for SDI output or input, for example, the SDI HD BNC SFP module (order code: **PHSFP-RT30-HDBNC**).
- Use the **Audio I/O** D-type connector to loop the audio pulse carried on the AES channel pair. For pinout details, see the section [Audio I/O D-type connector](#). Access these connections using the Sx TAG Breakout cable (order code: **PHSXC-1**).
- Genlock to external reference or free run.

Audio Propagation Delay Testing:



- Use an SDI SFP for SDI output or input, for example, the SDI HD BNC SFP module (order code: **PHSFP-RT30-HDBNC**).
- Use the **Audio I/O** D-type connector to loop the audio pulse carried on the AES channel pair. For pinout details, see the section [Audio I/O D-type connector](#). Access these connections using the Sx TAG Breakout cable (order code: **PHSXC-1**).
- Genlock to external reference or free run.

Signal Data (Option: PHSXOSD)



The Signal Data menu option (**PHSXOSD**) shows the video signal as a data stream in several formats as described below. In each mode, the data may be displayed in hexadecimal, decimal or binary formats. The binary format is not available in grid mode. The data may also be displayed as 10-bit or 8-bit format.

To simplify scrolling around the SDI signal view, use the cursor keys to move the red focus rectangle to the data display and press **OK**. The focus rectangle should change to a blue color and the cursor keys allow the display to be scrolled in any direction. The menu keys at the bottom allow the Line / Sample to be adjusted by 10 or 100 in any direction.

Note: Note that the line number of a line of video changes at the end of active video. This gives the unusual side-effect that the line number for pixels in horizontal blanking is the same as the line number for the active picture after that line.

Analyzer Source Selection

The Signal Data display can view the SDI input (**In1**), the SFP video input (**SFPIn**), or the generator SDI test pattern (**Out 1**). Selection is via the dropdown menu in the bottom right-hand corner of the menu.

Note: Note that when in Color modes other than YCbCr 422 10 bit, the pixel RGB or YCbCr values are packed into 10 bit values across the different streams and will, therefore, give unfamiliar values. When the **UnPack** checkbox is selected, the values in the active picture are unpacked to RGB or YCbCr values.

Type

Grid:

In this mode the data is shown in an X-Y format with lines and samples at the same time. This is a representation of the picture but in data format. If the cursor keys are used to select the grid window and **OK** pressed, the cursor keys will scroll around the window. The luma (Y) channel is shown in white whilst the Cr and Cb channels are shown in with a red or blue tint respectively.

Strm:

This is one of three modes for displaying the samples on the current line only. The cursor keys may be used to scroll the sample number when **OK** has been pressed. The **info** column shows the type of data being displayed:

- AP - Active picture
- VBL - Vertical blanking
- HBL - Horizontal blanking

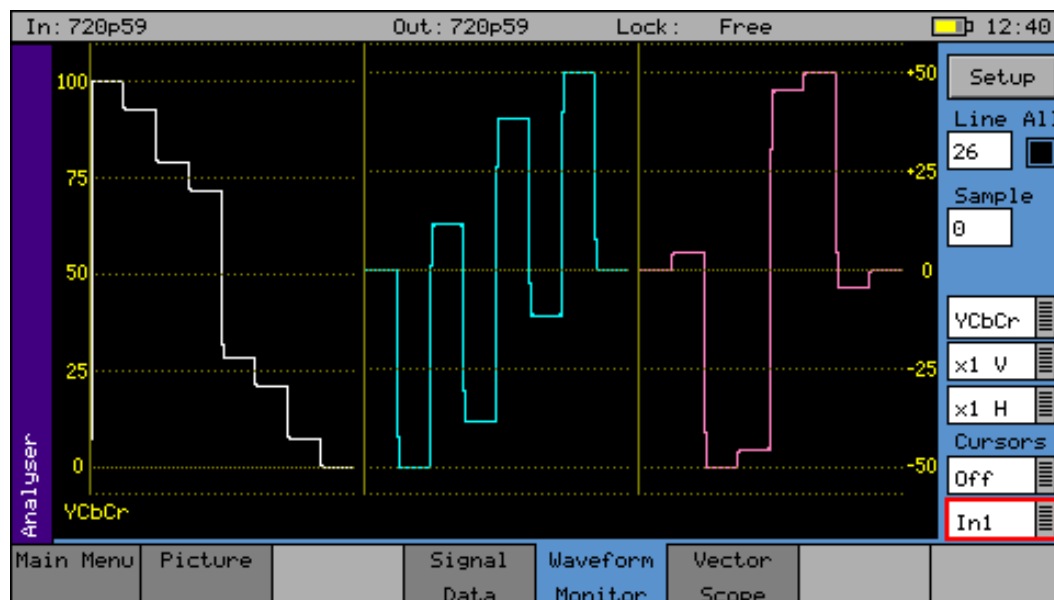
Comp:

This is similar to the Strm mode above but in a component mode with Cr and Cb in different columns. See **Strm** mode above for the **info** column description.

Split:

This mode shows the two streams split into four parts to show Y, Y', Cr and Cb in separate columns. See **Strm** mode above for the **info** column description.

Waveform Monitor

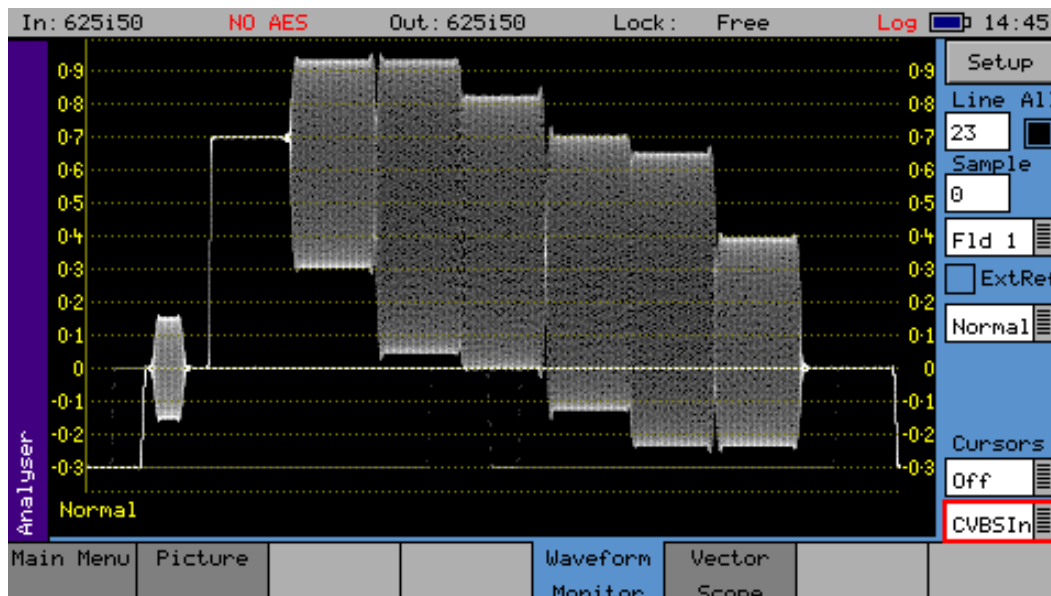


The **Waveform** menu displays the selected input in the form of a waveform monitor.

The display may be restricted to a single line, or all lines may be displayed at the same time. The display can be formatted as all streams (Luma and Chroma), or just a single stream.

Analyzer Source Selection

The Waveform monitor can display the Composite input, the SDI input, the SFP video input, the analog locking Reference input, or the generator test pattern, selected using the dropdown menu in the bottom-right corner of the menu.



The displayed options differ depending on whether SDI or Composite video is being displayed.

Sample, Line and Field Selection

The line, sample and field controls all track the related controls on other pages.

The **All** checkbox forces the waveform monitor to display all lines, overlaid on each other. Otherwise the specified line is displayed.

Sample:

Specify the current sample for analysis.

Line:

Specify the current line for analysis. This is useful when test patterns are transmitted as part of a program on specific video lines.

Field:

Only used for interlaced formats. This control selects the field for analysis. If the current line is in **Field 1**, changing the field will change to the same line in **Field 2**. The field number will change to show the correct field for the current line number.

The waveform will automatically view the horizontal or vertical blanking areas if the line or sample values are in the blanking area.

Waveform Type

The waveform monitor displays the selected signal in one of five formats as set by the Mode control:

YCbCr:

The Y, Cr and Cb waveforms are shown as three separate waveforms in a Parade format

Y:

Only the luminance channel is shown

Cb:

Only the blue chroma channel is shown

Cr:

Only the red chroma channel is shown

GBR:

The Green, Blue and Red waveforms are shown as three separate waveforms in a Parade format

Red:

Only the red channel is shown

Green:

Only the green chroma channel is shown

Blue :

Only the blue chroma channel is shown

XYZ, X, Y, Z:

Settings in the Waveform monitor display the 2K-SDI XYZ color space in its native form; so test patterns such as Legal Ramp in 2K XYZ, will be displayed as curves instead of straight lines.

X'Y'Z', X', Y, Z':

Settings in the Waveform monitor display the 2K-SDI XYZ color space with a reverse transform; so test patterns such as Legal Ramp in 2K XYZ will be displayed as straight lines.

Normal:

This shows the full composite video waveform.

Chroma:

This shows the chrominance of the composite waveform.

Low Pass:

This shows the low pass luminance of the composite waveform.

Magnification

The next two controls show the vertical and horizontal magnifications. If either value is set to a value other than **x1**, a vertical or horizontal offset will be shown on the bottom right edge of the Waveform display.

The waveform can be offset by moving the focus cursor to the Waveform window and pressing **OK**. The menu keys can then be used to scroll around the window. The offset will be the same for all magnification values, so switching between **x1** and **x5** will not lose the offset used in **x5** mode.

The vertical offset values are in signal level bits but displayed in the current scale units, so switching between scales will keep the same offsets.

Cursors

Cursors may be displayed over the waveform to allow measurement of time or amplitude values. The cursor may be set to several modes:

Off:

Cursors are hidden

Pict.:

The cursor is displayed at the current pixel point. If in YCbCr or RGB mode, three cursors are displayed. Otherwise a single cursor is displayed. The cursor position tracks across the picture monitor and Signal Data tabs.

Ampl.:

Two cursors are displayed to allow measurement of signal amplitudes.

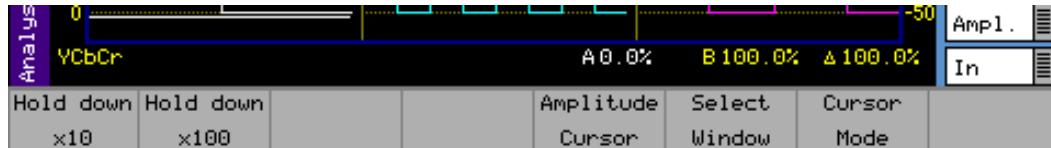
Time:

Two cursors are displayed to allow measurement of signal timing.

Both:

Amplitude and time cursors are displayed.

To use the cursors, use the navigation keys to move the focus to the waveform display and press **OK**. You should then get a display similar to that below. Note that the menu keys shown depend on the display mode and cursor mode.



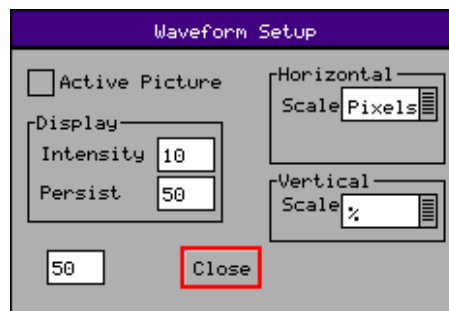
The navigation keys now move the selected cursor around the waveform display which will scroll if moved out of the visible area. The **x10** and **x100** buttons magnify the action of the navigation keys if held down.

The **Select Window** button is only available in YCbCr or RGB modes and selects the window in which the cursor is displayed.

The **Amplitude Cursor** and/or the **Timing Cursor** buttons switch the currently active cursor. In each direction two cursors are displayed. The currently active cursor is the one displayed as a full line (rather than the dotted cursor). The bottom of the waveform screen shows the cursor measurements in the current format which may be Decimal, Percentage or Hexadecimal for amplitude measurements or Pixels/μs for timing measurements. The difference between the two cursors is also displayed in absolute form.

The **Cursor Mode** button changes the current mode without having to leave the navigation window.

Waveform Setup Dialog



The **Waveform Setup** menu allows the vertical and horizontal scale of the waveform display to be set up, as well as controlling the intensity and persistence of the display.

Active Picture:

If checked, only the active picture is displayed for picture view and waveform monitor, all other VBI data such as TRS words ANC data and audio is blanked. This control tracks the state of the ActPix control on the Picture.

Vertical Scale:

The axes and measurements for the waveform monitor can be displayed either in percentages or in hex or decimal values as required.

Horizontal Scale:

The timing measurements may be set in either pixels or micro-seconds (μs)

Intensity:

Controls the brightness of the waveform.

Persistence:

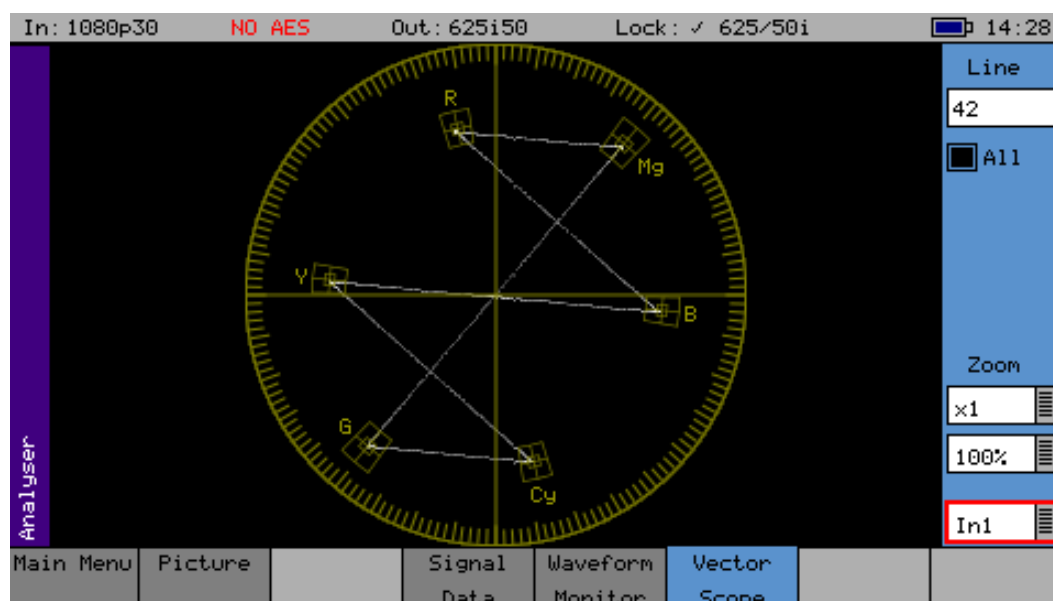
Controls the amount of time each pixel sample of the waveform remains on the display before it is replaced by a new value.

When viewing the composite or reference input, the displayed waveform is a digital rendering of the actual analog signal. This may have interference artefacts due to data sample rate differences between the display and the data itself. The value in the numeric box below Persistence can be used to control these artefacts without losing waveform resolution.

External Reference

Selecting the Ext Ref checkbox when a PAL or NTSC signal is being viewed, will horizontally reposition the waveform to show the difference in position between the composite input signal and the locking reference signal.

Vectorscope

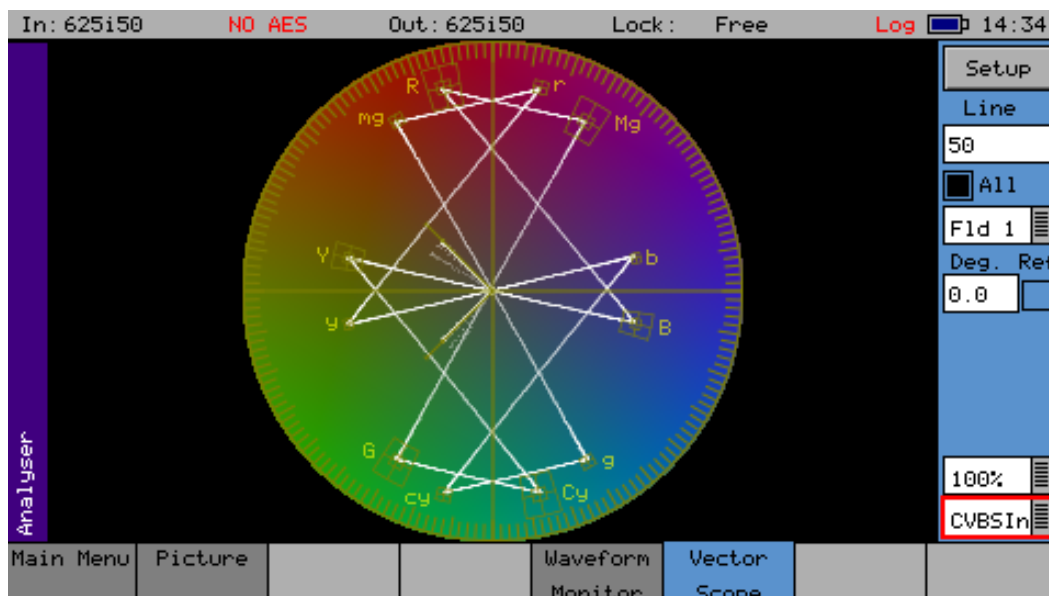


The Vectorscope menu displays the selected input in the form of a vectorscope. This may be set to show either the 100% bar positions or 75% positions. The color bar position boxes will change according to the color space, for the current input video standard.

The Vectorscope will automatically apply the appropriate transforms to display the images in YCbCr, RGB and XYZ color spaces correctly. The color space transform to be applied is defined by the SMPTE 352 payload.

Analyzer Source Selection

The Vectorscope can display the Composite input, the SDI input, the SFP video input, the analog locking Reference input, or the generator test pattern, selected using the dropdown menu in the bottom-right corner of the menu.



The displayed options will be different depending on whether SDI or Composite video is being displayed.

Sample, Line and Field Selection

The line, sample and field controls all track the related controls on other pages.

The **All** checkbox forces the Vectorscope to display all lines, overlaid on each other, otherwise the specified line is displayed.

Line:

Specify the current line for analysis. This is useful when test patterns are transmitted as part of a program on specific video lines.

Field:

Used only for Interlaced formats. This control selects the field for analysis. If the current line is in Field 1, changing the field will display the same line in Field 2. The field number will change to show the correct field for the current line number.

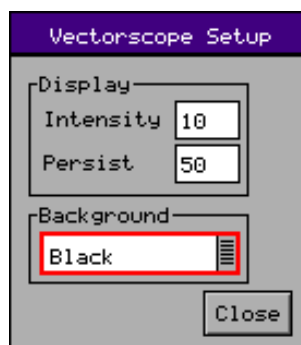
Magnification

The Zoom function allows the Vectorscope display to be zoomed-in to the Center, Cyan, Yellow, Green, Magenta, Red or Blue positions at x1, x2, x5, or x10 magnifications.

Graticule

The **100%** / **75%** dropdown selects the graticule scale to match the color bars being analyzed.

Vectorscope Setup Dialog



The **Vectorscope Setup** menu allows the intensity and persistence of the display to be adjusted. A color wheel background can also be added.

Intensity:

Controls the brightness of the displayed signal

Persistence:

Controls the amount of time each pixel sample of the vectorscope remains on the display before it is replaced by a new value

Background:

Allows the selection of different intensities of the color wheel as the graticule background.

Composite Subcarrier Phase Alignment

When viewing a PAL or NTSC signal, the **Ref** checkbox, when selected, will lock the Vectorscope to the subcarrier phase of the locking reference signal. The value entered into the **Deg** (degree) box to place the PAL or NTSC burst in the correct alignment is a measure of the subcarrier phase difference, between the input signal and locking reference.

Signal Information Menu

Overview

The **Sig Info** pages give a detailed view of the status of the input (or generator output) signal. They are sub-divided into Video, Misc, and Ancillary (ANC) Status. The option (**PHSXOSD**) provides an **ANC Inspector** page. Where an SFP is present, an SFP Info page will be available. In the case of an HDMI output SFP, an EDID Info page will also be displayed, when the option (**PHSXO-EDID**) has been purchased.

Video Status

The screenshot shows the 'Signal Information' menu with the 'Video Status' tab selected. The top status bar displays 'In: 625i50', 'Out: 625i50', 'Lock: Free', and 'Log' with a battery icon and time '12:10'. The 'CRC/EDH Errors' section shows a running time of 00:28:43, source 'In1', and a 'Clear All' button. Below this is a table of errors for In1, with columns for OK Time, Errors, and Rate. The 'EDH Data' section shows data for 1 Field 2, including AP - Rx, AP - Calc, FF - Rx, and FF - Calc. The 'Cable Length' section shows 'In1: 0m' and 'Cable: B1694A'. The 'Active Picture CRC' section shows 'In1: E4F5 A9DD' and 'Changes: 0'. The bottom navigation bar includes 'Main Menu', 'Video Status', 'Misc Status', 'Video Timing', 'ANC Status', 'ANC Inspector', and a blank space.

OK Time	Errors	Rate
EDH AP 00:28:43	0	0.00/s
EDH FF 00:28:43	0	0.00/s
ANC 00:28:43	0	0.00/s

	FF	AP	ANC
ues	0 0	0 0	0 0
ida	0 0	0 0	0 0
idh	0 0	0 0	0 0
eda	0 0	0 0	0 0
edh	0 0	0 0	0 0

The Video Status menu shows the status of the selected video input and displays any errors found in the datastream.

CRC/EDH Errors

The **CRC/EDH Errors** section displays the EDH or CRC status of the analyzer input as appropriate for the video standard being monitored. The status of each CRC/EDH count is displayed as the number of seconds since an error occurred. The individual CRC fields may be reset individually or together. The **Running** time field shows the time since the last error reset occurred. The error rate field shows the number of errors per second. The running time will also be affected by the input being lost or intermittent. CRC errors are ignored on the switching line if the **Ignore switch line** checkbox is checked.

ANC checksum errors are also detected and counted and may be logged.

When analyzing a 3G-Level B signal, the CRC status is displayed for each link or stream present according to the input video format.

EDH Data

If the signal is SD (PAL-625 or NTSC-525) the EDH values for both active picture (AP) and full-field (FF) are displayed for each field. To enable engineers checking EDH integrity, the EDH values calculated for active picture and full-field are also displayed.

Under normal conditions, the EDH-AP values should be constant, the full-field values may change if audio or other ancillary data is embedded in the SDI signal.

The EDH flags for active picture, full-field and ancillary data are also displayed for diagnostic purposes:

ues:

Unknown error status: Set to 1 if the previous device received an SDI signal from a device not supporting EDH.

ida:

Internal Error Detected Already: Set to 1 if an idh flag was received by the previous device.

idh:

Internal Error Detected Here: Set to 1 if a hardware error was detected in the previous device.

eda:

Error Detected Already - Set to 1 if an SDI error was detected in the signal received by the previous device.

edh:

Error Detected Here - Set to 1 if an SDI error was detected. In the case of ancillary data, this means that one or more ANC data packets had an incorrect checksum.

Note that there is only one EDH detector which is connected to the input currently being analyzed. On an Sx instrument with multiple video inputs, only the current input being analyzed can check for EDH errors.

Cable Length

The Sx instrument measures the cable length connected to the SDI input BNC and the measurement is only an approximate value. The cable type may be set to one of the following:

- Belden 8282, 1694A, 1505, 1855A.
- Canare L-5CFB
- Image 1000

The selected cable type will affect the cable length measurement.

Active Picture CRC

16-bit CCITT CRCs are calculated for the active picture data of the received signal. This can be used to give a known value for known static picture content and allows the user to determine if the active picture content is as expected.

CRCs are calculated independently upon each 10-bit stream (luminance and chrominance) of the interface.

For example, the generated 1920x1080, 100% bars in YCC422-10 should always produce a luminance CRC of 0x0AB4 and a chrominance CRC of 0xB88E, no matter what scanning mode (interlaced, segmented frame or progressive) or frame rate is used.

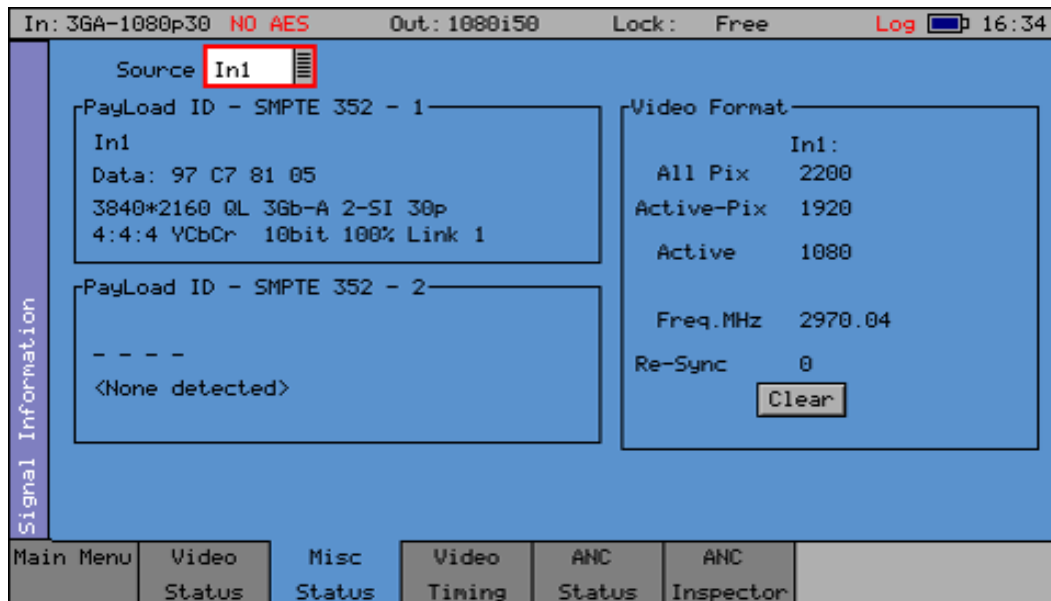
Note: When using 4:4:4, 4:4:4:4 or 12-bit video formats (in dual-link or 3Gbps) the CRCs are calculated for each of the packed 10-bit virtual interfaces and will therefore generate different values from those for YCC422-10.

Misc Status

The **Misc Status** menu displays the auto-detected and SMPTE ST352 (VPID) parameters of the selected SDI source and highlights any detected errors or unsupported parameters.

When analyzing a 3G-Level B signal, the SMPTE 352 status is displayed for each link or stream present according to the input video format.

Note: The Sx now supports the SMPTE 352 video payload identifier (VPID) on a single interface of 4 x 3G and 4 x 1.5G links.



Payload ID – SMPTE 352

If the Sx instrument detects a SMPTE 352 ancillary packet, the detail of the packet content is displayed in this section in both hex and decoded format.

The display lists the following elements contained in the SMPTE 352 packet in decoded form:

- SMPTE Standard
- Digital interface transport mapping structure
- Digital interface transport structure (progressive or interlaced)
- Digital interface picture structure (progressive or interlaced)
- Transfer characteristics (SDR, HDR)
- Picture frame rate
- Picture aspect ratio
- Number of active pixels in picture
- Number of lines in picture
- Sampling structure
- Bit depth
- Colorimetry
- Payload channel number for multiple payloads
- Audio channel usage

Video Format

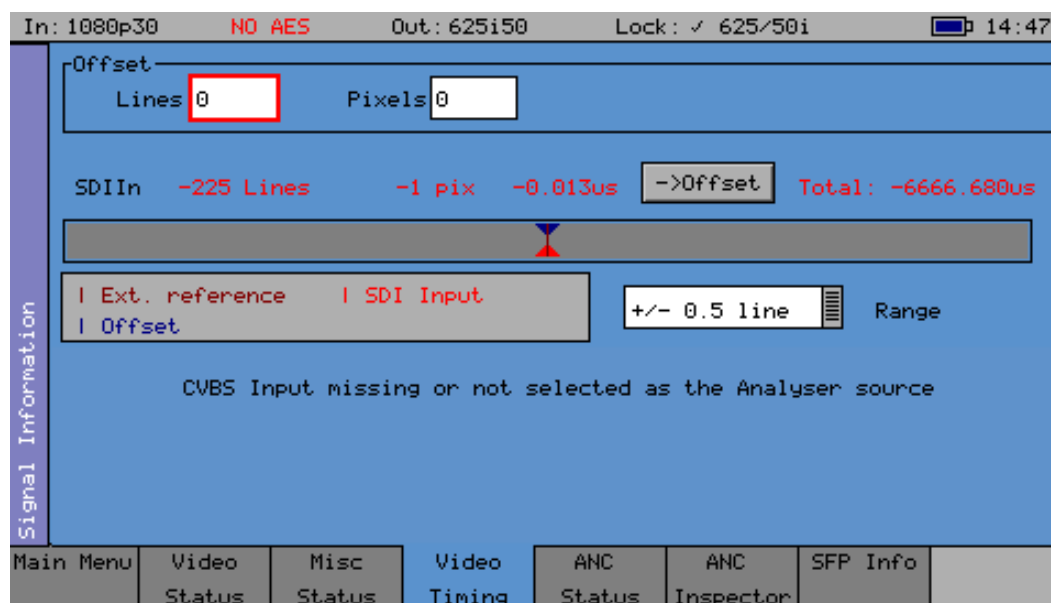
This section displays the currently auto-detected pixel counts, active line count and the frequency of the selected input source.

Note: The displayed video frequency is correct only if the Sx instrument has been calibrated and free running or has been connected to an accurate reference input.

If the input signal is not a known signal, for example, if the line count or pixel count is not recognized, the input status on the top line will show **Invalid** but the values in this section will be updated every few seconds.

The **Re-Sync** counter displays the number of times the SDI data has been re-synchronized and can help detect intermittent SDI signal problems. Press **Clear** to reset this counter.

Video Timing



The Video Timing menu displays the relationship between the chosen input (SDI, SFP, or composite) with respect to the locking reference input.

The timing of the chosen input signal is displayed relative to the external reference. If no reference is present, then an error message is displayed. If the signal is timed to within ± 2 samples the values are displayed in a black font, in lines and samples (spl). If mistimed, then they will be displayed in red. A bar graph also displays the timing value which may either be line timing (± 0.1 lines or ± 0.5 lines) or frame timing (± 0.5 frame). The total timing value is also displayed in microseconds.

The red arrow on the bar shows the SDI input timing and the blue arrow shows the current target timing point. The brown vertical line shows the timing of the reference signal.

To compare timings of different signals, connect the signal to be compared to the SDI input and select the **->Offset** button to make this the current offset. All future timings will be relative to this offset value.

To clear the current offset, move the focus to the two offset fields, press **OK** to edit them and then press **Default**.

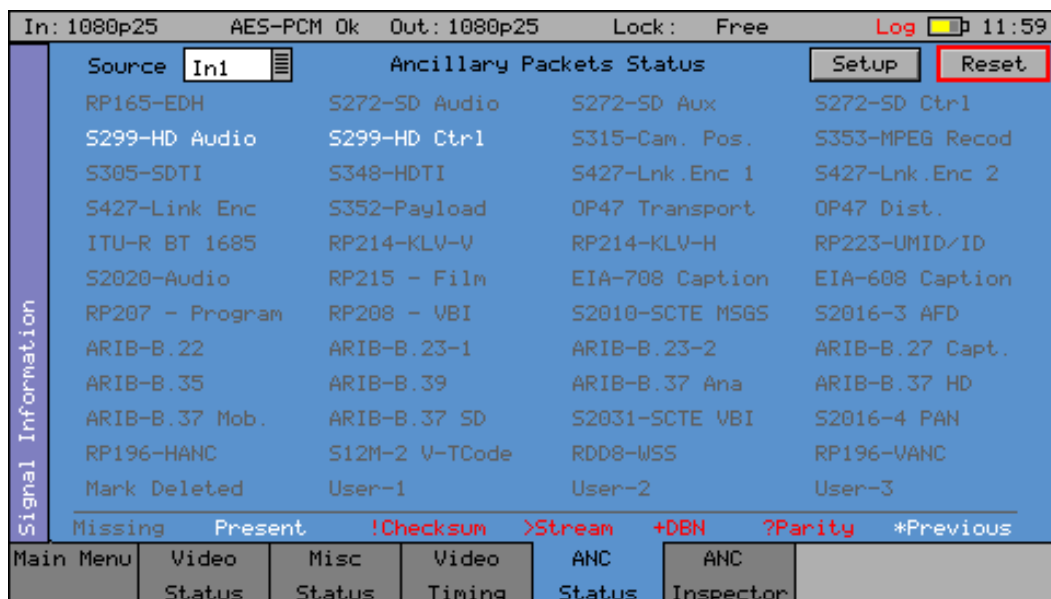
Note: All timing measurements are relative to line 1 on the SDI signal and line 1 on the reference signal. This can lead to different values from other test and measurement instruments that include an SD (PAL/NTSC) offset in their calculations. By comparing line 1 timings, the Sx instrument can be used to measure time delays accurately through up / down / cross converters.

ANC Status

The Ancillary Packets Status tool provides broadcasters, studios, OB and broadcast manufacturers with a detailed analysis of the ancillary data present in an SDI signal.

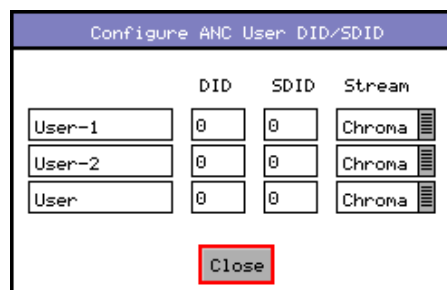
A simple grid layout provides a quick overview of the available VANC/ANC ancillary data for an engineer. The packet type is then displayed as present, absent or red if in fault. Simple icons next to the packet indicate the fault. Each ancillary packet available from the grid view can be set to enable logging and then presented together with other information in the events window of the logging menu.

This tool further allows additional user-defined selections with the appropriate DID or SDID code. Any ancillary packet code can be saved down for future recall. Note that the Ancillary Packets Status tool does not fully decode the ancillary data but is used to identify whether the packet is present in the signal.



The **ANC Status** menu shows which ANC packets are present on the SDI input and whether they have any errors. Each field is color-coded according to whether the ANC packet is present (White), missing (Grey), has errors (Red), or has previously had errors (yellow).

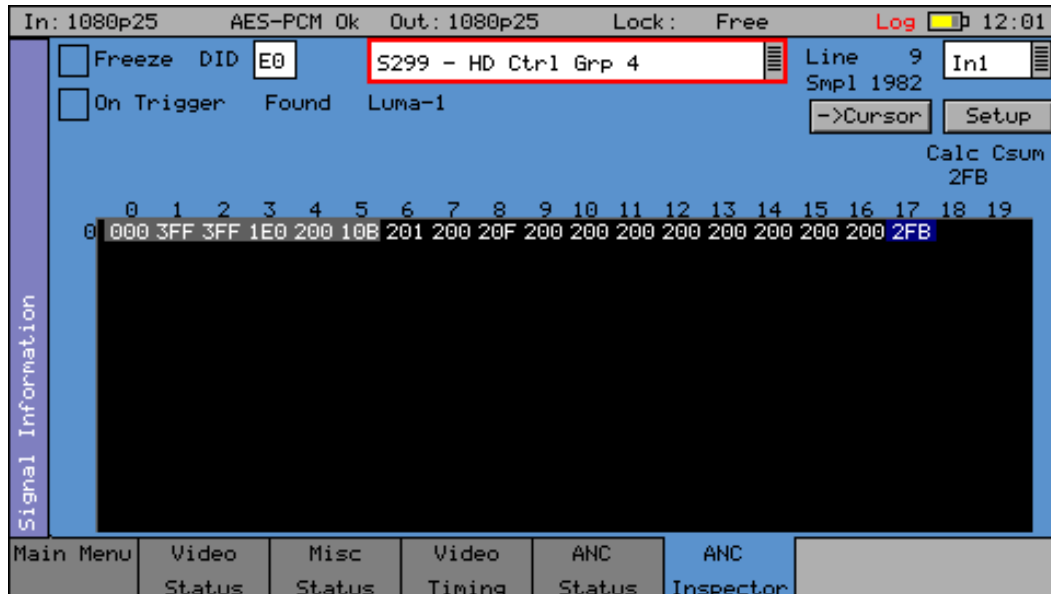
If the field has errors then a symbol beside the field shows which error type it is. The bottom of the page shows the symbol for each type of error. The **Reset** button resets the Previous Errors state.



The **Setup** button and dialog allows user-defined ANC packets to be configured.

The packet name, data ID (DID) and SDID may be specified for up to three user-defined ancillary packets. The **Stream** field specifies whether the packet should be on the chroma stream, the luminance stream or both.

ANC Inspector (SDI Data Option: PHSXOSD)



The ANC Inspector menu option (**PHSXOSD**) allows Ancillary data packets to be detected and checked for errors.

The ANC Inspector menu displays details of the ANC packets.

The packet type can be selected using either the dropdown list of known packets or the DID/SDID number fields. If the DID/SDID values match a known type, then that type will be selected in the dropdown list. This may be further filtered using the checkboxes on the **Setup** dialog.

The Line and sample number of the detected packet is displayed to facilitate debugging of generation equipment. The complete data packet is displayed as a hexadecimal grid at the bottom of the page and may also be decoded into text above the grid.

If an error occurs in the packet, the header and checksum are displayed in red.

The display of data may be frozen by pressing the Freeze checkbox.

The **Found** description shows in which stream the ANC packet was detected, Chroma or Luma and what kind of trigger was detected. This may be:

C:

Checksum Error

D:

DBN (Data block number) Error

P:

Parity Error

G:

ANC Gap error

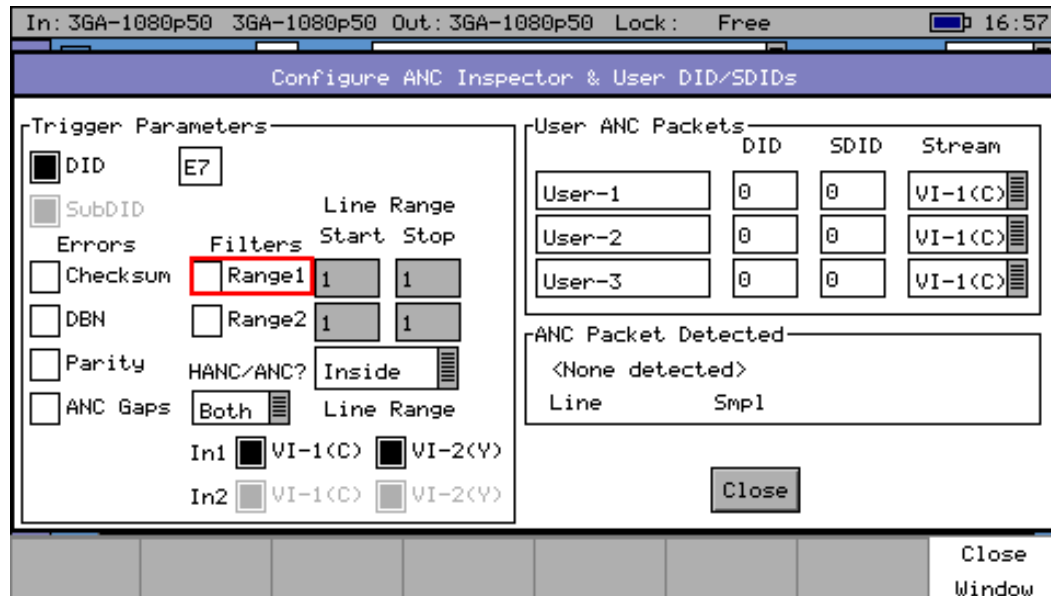
Several of the above flags may be displayed at the same time.

The detected ANC packets may be filtered using the **Setup** dialog. This allows a great deal of freedom in setting when the display will be triggered.

If the **On Trigger** checkbox is selected the data packet will cause the display to be frozen and the **Freeze** checkbox will turn red when a trigger condition is met as described below. Uncheck **Freeze** to restore normal operation.

The **->Cursor** button will copy the Line and Sample numbers to the SDI data view cursors to simplify navigation to the ANC packet under investigation.

ANC Inspector Setup



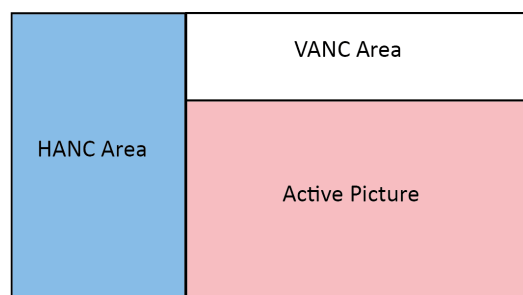
If the **Setup** button is pressed a dialog box allows the ANC packet trigger parameters to be set. The trigger parameters allow only selected lines to be checked or excluded when checking for the presence of packets.

Line Range Filter:

If either of the **Line Range** filter checkboxes are checked then the range of lines that the ANC inspector will check is restricted to that range. If the dropdown below the range is set to **Inside** then it will only check ANC packets within the range (including the start and end lines). If set to **Outside** it will check only ANC packets outside the specified range.

HANC/VANC Filter:

Provides another filter for simpler selection of the area in which to search for packets. It may be selected to search the HANC area, the VANC area, or both areas.



Error Triggers

If any of the **Errors** checkboxes are selected, then the ANC packet data will only be displayed if an error occurs. The error states detected are:

Checksum:

A checksum error in a packet was detected. (Sum of data between DID and final UDW)

DBN:

A Data Block number error was detected in an audio packet. The DBN field (in the same place as the SDID) of an audio packet should either be 0 and never change, or increment from 1 to 255 and then start at again at one.

Parity:


A parity error was detected for the DID, SDID and DataCount words in a packet. (Even Parity used and bit 9 is the inverse of bit 8.)

ANC Gaps:

The ANC packets were separated by a gap containing video blanking data. EDH (DID=0xf4) packets are ignored. Note that if an EDH packet is marked for deletion, this will result in an ANC GAP error.


The Setup dialog also shows when an ANC packet has been detected and where it was found. This makes changing a filter simpler as the effect of the filter can be determined without closing the dialog. This dialog also allows the user defined ANC packets to be configured.

SFP Info

In: 1080p30		NO AES		Out: 625i50		Lock: ✓ 625/50i		 14:45							
Signal Information	SFP Information														
	SFP Type		OPT Tx+Rx		Tx Power		0.0000mW		Rx Power		0.0001mW				
	Temp		45.55 C												
	ID		85h		Ext. ID		04h		Connector		07h				
	StdsCompl		41h		TxRxCod-1		00000000h		TxRxCod-2		00000003h				
	Encoding		03h		NomBitRate		3000Mbs		Len 9um		30000m				
	Len 50um		0m		Len 62.5um		0m		Len Copper		0m				
	Vendor		GENNUM		Vendor OUI		00h		Part Code		602929-31Cr				
	Vendor Rev		00h		Wavelength		1310		CC Base		6ah				
	Options		1ah		UpdBitRate		5%		LwrBitRate		95%				
SerialNo		Z112308MJ		MfgDateCod		110622		CC Ext		47h					
Res-13		00h		Res-19		00h		Res-36		00h					
Res-62		00h		Res-92-94		68f00547h									
Main Menu		Video		Misc		Video		ANC		ANC		SFP Info			
		Status		Status		Timing		Status		Inspector					

The SFP Info menu displays details of the currently installed SFP module.

HDMI EDID Display (Option: PHSXO-EDID)

In: Absent		NO AES		Out: 3GB-1080p50		Lock: Free		Log  23:44	
Signal Information	<input checked="" type="checkbox"/> Refresh	<input type="checkbox"/> Raw	EDID Information						
	Section	Monitor	Estb. Modes	720x400@70, 640x480@60					
	ModelName	DELL 2408WFP	Estb. Modes	800x600@72, 800x600@75					
	VendorName	"DEL"	Manufacturer	Specific=0x00					
	Product Code	41004	Horizsync	30-83					
	SerialNum	825642579	VertRefresh	56-76					
	Manufactured	week 38 of 2008	Maximum pixel	clock is 170MHz					
	EDID Ver	1.3	ModeLine	"1920x1200" 154.00					
	Type	Digital Display	1920 1968	2000 2080 1200					
	VESA DFP	no	1203 1209 1235	+hsync -vsync					
	Display Size(cm)	52 x 32	Not giving standard mode:						
	Gamma	2.20	1280x1024@60 5:4	Clock=78.00 Mhz					
	DPMS	standby suspend loff	1600x1200@60 4:3	Clock=115.00 Mhz					
	Colour Support	RGB444+YCC444	1152x864@75 4:3	Clock=74.00 Mhz					
	Standard sRGB	No	EDID Ext Blocks: 1						
	GTF	No							
	Preferred timing found								
	Red X/Y(CIE)	690 327							
Green X/Y(CIE)	192 723								
Blue X/Y(CIE)	152 66								
White X/Y(CIE)	321 337								
Main Menu	Video	Misc	Video	ANC	ANC	SFP Info	EDID Info		
	Status	Status	Timing	Status	Inspector				

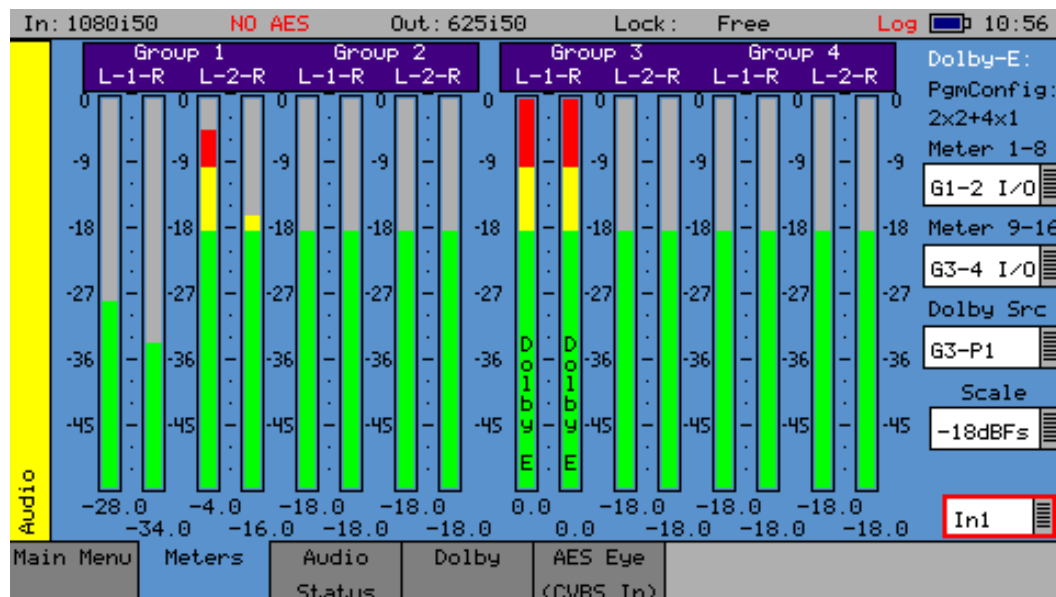
The HDMI EDID viewer option (**PHSXO-EDID**) displays both RAW ancillary data and decoded EDID information in a tabular display. It obtains the EDID information using a dedicated SFP and cable (**PHSFP-HDMI-OUT**), which must be purchased separately. For those customers requiring support for 3G formats, an additional license (**PHSXO-3GADV**) will be needed.

In: Absent NO AES Out: 3GB-1080p50 Lock: Free Log 23:44							
Refresh Raw EDID Information							
Signal Information	Offset						
	0	00	ff	ff	ff	ff	ff 00
	8	10	ac	2c	a0	53	4e 36 31
	16	26	12	01	03	80	34 20 78
	24	ea	b3	25	ac	51	30 b4 26
	32	10	50	54	a5	4b	00 81 80
	40	a9	40	71	4f	01	01 01 01
	48	01	01	01	01	01	01 28 3c
	56	80	a0	70	b0	23	40 30 20
	64	36	00	07	44	21	00 00 1a
	72	00	00	00	ff	00	47 32 38
	80	36	48	38	39	47	31 36 4e
	88	53	0a	00	00	00	fc 00 44
	96	45	4c	4c	20	32	34 30 38
	104	57	46	50	0a	00	00 00 fd
	112	00	38	4c	1e	53	11 00 0a
	120	20	20	20	20	20	01 f2
Main Menu Video Misc Video ANC ANC SFP Info EDID Info							
Status Status Status Timing Status Inspector							

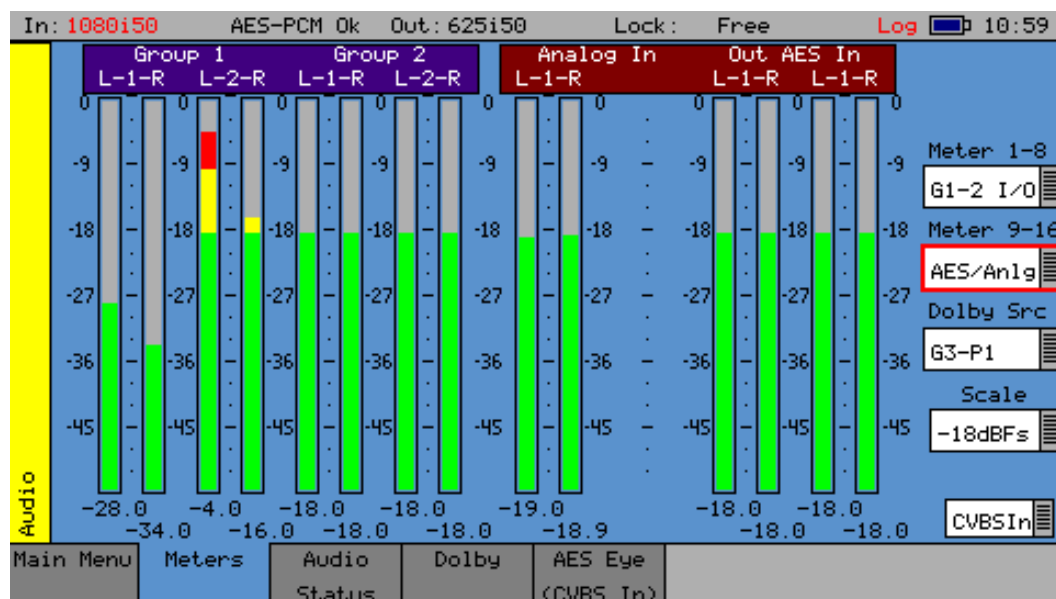
EDID display of RAW data. In addition, the HDMI EDID display option can be used in conjunction with the generator, providing an SDI pattern which is generated through the HDMI SFP which can be used to test a monitor display.

Audio Menu

Meters

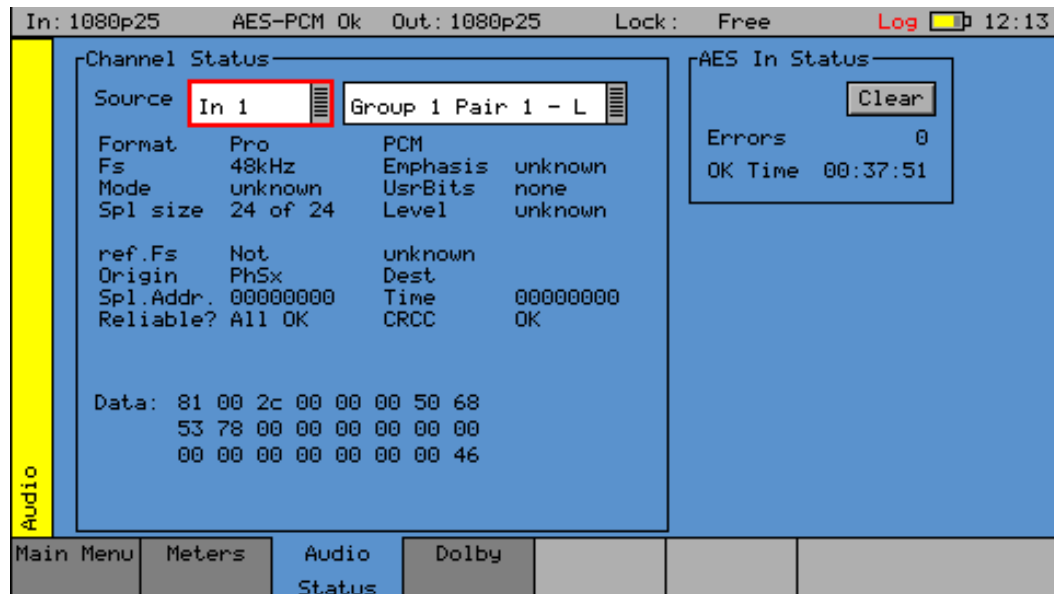


The audio **Meters** menu displays up to 16 audio channels. The source for each block of eight meters may be independently set to allow simultaneous metering of eight inputs and eight outputs or all 16 channels in an embedded SDI stream.



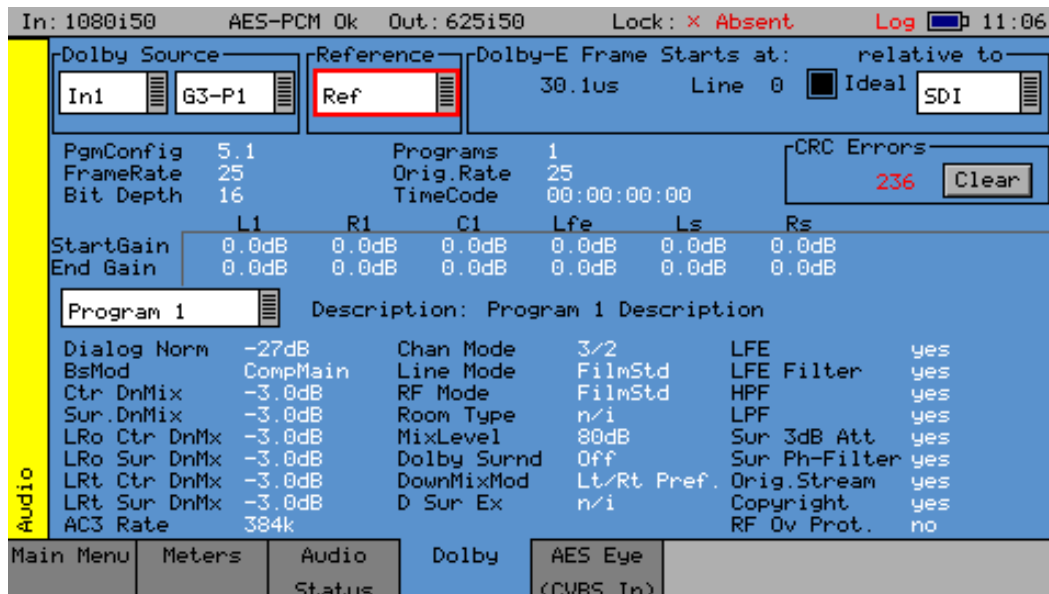
If AES or analog inputs or outputs are present then these may also be metered. At the bottom of each meter is the current audio level for that channel in dBFS (decibels relative to 0 dB full-scale).

Audio Status



The **Audio Status** menu shows the Channel Status for the selected audio channel displayed in decoded form as well as a hexadecimal dump of the bytes. The source may either come from the input signal or from the generator for comparison purposes.

Dolby (Dolby Analyzer Option: PHSXO-DAG)



The **Dolby** Analysis option allows display of the Dolby E metadata present in the selected audio stream and determines whether the Dolby E packet is timed correctly on the SDI video stream.

This option therefore allows the Dolby E aspect of the signal to be timed correctly at all stages in a broadcast chain.

Checks can be made to see that the Dolby E has been created correctly and transferred transparently through the broadcast chain, unaffected by routers/switchers, satellite links, etc.

Overview

There are a number of Dolby broadcast digital audio standards that transport audio data over an SMPTE 337M AES carrier with a 48 kHz sample rate:

- Dolby E
- Dolby Digital
- Dolby Digital Plus

These standards can be used to transport mono, stereo, 5.1 and 7.1 audio programs:

Dolby 5.1

Involves five channels for standard-range speakers (20 Hz to 20,000 Hz) (right front, center, left front, rear right, rear left) and one channel (20 Hz to 120 Hz allotted audio) for the subwoofer-driven low-frequency effects.

Dolby 7.1

Uses six channels in the primary program (Independent Substream) for a standard 5.1 surround sound mix and then the remaining two channels in an ancillary program (Dependent Substream) to provide the additional down-mix.

Dolby E

Dolby E is an audio encoding and decoding technology developed by Dolby Laboratories that allows up to eight channels of audio (mono, stereo, 5.1 or 7.1) that for a primary program (Program 1) and optional ancillary programs. These eight channels are compressed (lossless) into a digital stream that can be transferred between compatible devices and stored on a standard stereo pair of audio tracks. The most elaborate mode in common use is Dolby 7.1 which uses all eight channels to provide surround sound.

Dolby Digital

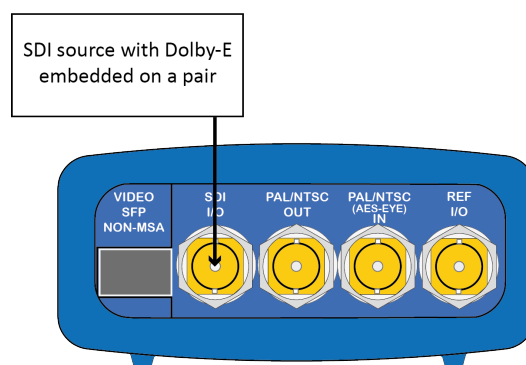
Dolby Digital (AC-3) is a *perceptual audio* system for digital audio that allows the reduction of data needs to deliver high-quality sound. This system was developed primarily for DTV, DVD and HDTV. This format allows up to six channels of sound (mono, stereo or 5.1) in the form of a single 'program' that can be delivered at different bit rates. These 6 channels are compressed (lossy) into a digital stream that can be broadcast. The most elaborate mode in common use is Dolby 5.1 with uses all six channels to provide surround sound.

Dolby Digital Plus

Dolby Digital Plus (E-AC-3) is a more advanced version of Dolby Digital that provides a more efficient encoding algorithm offering a primary program and optional ancillary programs. These can be optionally delivered at lower bit rates than Dolby Digital.

Analyzer Reference

For correct decoding of Dolby E data, the internal audio circuitry requires a reference that is synchronized to the input signal. The Generator Reference must not be set to Free-Run or Dolby E errors may be detected. The description field will display **Invalid Reference** if an incorrect reference is selected.



In this example, the SDI signal contains embedded audio with Dolby E present on one or more audio pairs. The Sx instrument needs to lock its internal audio clock to the SDI signal **Generator → GenLock → GenLock Source → Input-1** and the Dolby Timing source should be set to **SDI**.

If the AES signal contains a Dolby E stream, the Sx TAG needs to lock its internal audio clock to the external reference signal, and the Dolby Timing source should be set to **Ext.Ref**. The AES source *must* be locked to the same reference as the Sx TAG.

Source Selection

The Dolby E may be monitored from any of the SDI input embedded audio channel pairs or the AES input.

Dolby E Framing Values

It is important for the Dolby E packet to be positioned well away from the video switching line so that Dolby E packets are not corrupted by downstream switchers. At all places in the signal chain where audio can be delayed by a different value to the video, the Dolby E packet needs to be re-timed to ensure that this timing specification is met. The position of the Dolby E packet in the video frame is displayed in lines and microseconds (μ s).

Dolby E Timing Source

Dolby E timing may be measured relative to the SDI input or the External reference. If the **Ideal** checkbox is checked, the Dolby E Frame timing is relative to the normal position that it should be, i.e., it should be as close to 0 as possible. Each video standard has a specified *Ideal* line number on which the Dolby E packet should start. If the Dolby E timing line is outside the valid range of lines it will be displayed in red. If it is outside the ideal range it will be displayed in dark green – this is still a valid Dolby E position but not recommended by Dolby. The timing measurement is always displayed in terms of the SDI input lines and thus if an AES input is used as the Dolby E source, the line position will *not* be displayed.

If you do not have the same reference as the SDI source, you will have to set the Reference Source and Dolby Timing Source to be the SDI input.

Note: If Dolby E is present on a fast frame rate signal (50p, 59p or 60p) then it should always be referenced to an interlaced reference at the same field rate as the packet length is longer than a single frame and must start at the beginning of an even numbered frame.

Dolby E Program Configuration

In: 1080i50 Out: 1080i50 Lock: Free Log 11:42

Dolby Source: In1 G1-P1 Reference: Free-Run Dolby-E Frame Starts at: 29.2us Line 0 ☒ Ideal SDI

PgmConfig 5.1 Programs 1
FrameRate 25 Orig.Rate 25
Bit Depth 16 TimeCode 00:00:00:00

CRC Errors 0 Clear

StartGain L1 0.0dB R1 0.0dB C1 0.0dB Lfe 0.0dB Ls 0.0dB Rs 0.0dB
End Gain L1 0.0dB R1 0.0dB C1 0.0dB Lfe 0.0dB Ls 0.0dB Rs 0.0dB

Program 1 Description: Program 1 Description

Dialog Norm -28dB Chan Mode 3/2 LFE no
BsMod CompMain Line Mode none LFE Filter no
Ctr DnMix -3.0dB RF Mode none HPF no
Sur DnMix -3.0dB Room Type n/i LPF no
LRo Ctr DnMix +3.0dB MixLevel 80dB Sur 3dB Att no
LRo Sur DnMix +3.0dB Dolby Surnd n/i Sur Ph-Filter no
LR Ctr DnMix +3.0dB DownMixMod n/i Orig.Stream no
LR Sur DnMix +3.0dB D Sur Ex n/i Copyright no
AC3 Rate 384k RF Ov Prot. no

Main Menu Meters Audio Dolby Status

This displays the Program configuration (5.1+2 etc.), the number of programs in the metadata, the frame rates and bit depths and timecode if present.

CRC Errors:

Displays the number of CRC errors detected in the Dolby E metadata.

Start Gain:

These fields indicate the gain to be applied to the specified channel at the beginning of the audio frame when decoding.

End Gain:

These fields indicate the gain to be applied to the specified channel at the end of the audio frame when decoding.

Program Selection:

Selects which set of program metadata is shown. Up to eight programs can be encoded in the Dolby E packet dependent on the Program Configuration.

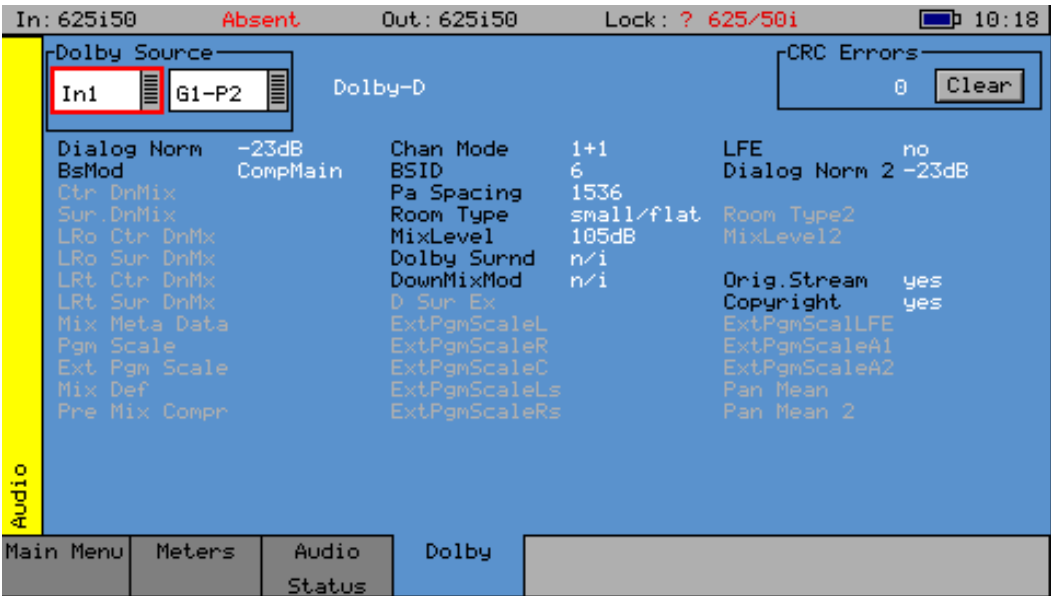
Program Description:

User-defined description for the selected program.

Program Metadata:

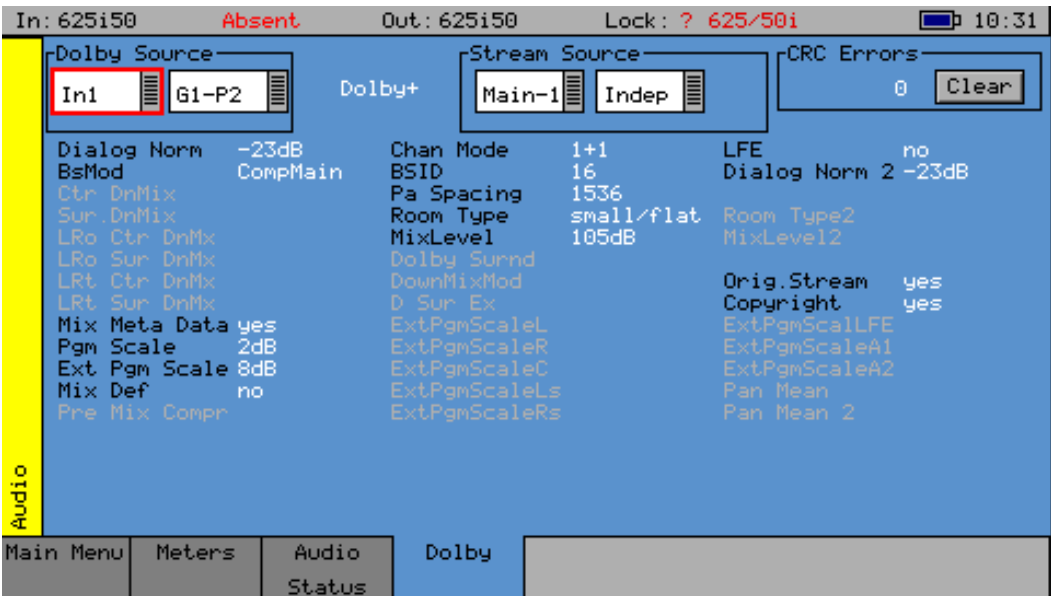
The metadata is displayed in a Dolby specified order. Any data not required for the Program Configuration specified is grayed-out and the data hidden.

Dolby Digital Program Configuration



When Dolby Digital metadata is analyzed this displays channel configuration and limited metadata that is sent with Dolby Digital.

Dolby Digital Plus Program Configuration



When Dolby Digital Plus metadata is analyzed, this displays the Main, Dependent and Independent program stream configuration and limited metadata that is sent with Dolby Digital Plus.

Program Metadata

The **Audio → Dolby** menu allows the metadata for a Dolby datastream to be viewed. For any program this metadata would be created as part of Dolby authoring process. The following metadata can be

viewed for a Dolby E Program 1:

Dialog Norm:

The normal audio level for dialog. Ideally all transmitted programs would have the same value.

BsMod:

Bitstream Mode indicates the type of audio service that the bitstream contains. Complete Main (CM) is the normal mode of operation and contains a complete audio program including dialog, music, and effects.

Ctr DnMix:

Center down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

Sur DnMix:

Surround down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

LROctrDnMix:

Left/right/stereo/center down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 7.1 Dependent Substream.

LROsurDnMix:

Left/right/stereo/surround down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 7.1 Dependent Substream.

LR CtrDnMix:

Left/right/center down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

LR SurDnMix:

Left/right/surround down-mix is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

Chan Mode:

Defines the channel configuration for Program 1 (i.e., mono, stereo, 5.1 channels).

Line Mode:

An Operational Mode / Dynamic Compression Mode, used by consumer and professional decoder products, that simplifies the implementation of Dialog Normalization, Dynamic Range Control, and down mixing functions, all of which are necessary in Dolby Digital products.

RFMode:

An Operational Mode / Dynamic Compression Mode, used by consumer and professional decoder products, that simplifies the implementation of Dialog Normalization, Dynamic Range Control, and down mixing functions, all of which are necessary in Dolby Digital products.

Room Type:

An informational parameter indicating the type and calibration of the mixing room used for the final audio mixing session.

MixLevel:

The Surround Down mix Level parameter indicates the nominal Lo/Ro down mix level of the Surround channel(s) with respect to the Left and Right channels.

DolbySurnd:

The Dolby Surround Mode parameter indicates whether or not a two-channel Dolby Digital bitstream is conveying a Dolby Surround encoded program.

DownMixMod:

Controls the Down Mix Mode, used by the content creator to optimize Center and Surround channel levels for use in stereo down mix mode for any two-channel programs.

D Sur Ex:

Controls the Dolby Surround Ex channel that provides an extra audio channel for Dolby 5.1. The extra surround channel of the Dolby Surround Ex system is matrix-encoded onto the discrete left-surround and right-surround channels of the 5.1 mix. The following control bits can also be viewed:

LFE:

The LFE Channel parameter enables or disables the Low-Frequency Effects (LFE) channel.

HPF:

This parameter can be used to activate the DC High pass filter for all input channels.

LPF:

The LFE Low pass Filter parameter can be used to activate a 120 Hz low-pass filter applied to the LFE input channel.

Sur 3dB Att:

The Surround Channel 3 dB Attenuation function is used to apply a 3 dB attenuation to the Surround channels of a multichannel soundtrack created in a room with film style calibration, when encoding it for consumer home theater playback.

Sur Ph+Filter:

The Surround Channel 90-Degree Phase-Shift feature is used for generating multichannel Dolby Digital bitstreams that can be down-mixed in an external two channel decoder to create a true Dolby Surround compatible output.

Orig. Stream:

The Original Bitstream informational parameter sets the value of a single bit within the Dolby Digital bitstream. This bit has a value of 1 (box checked) if the bitstream is an original. If it is a copy of an original bitstream, it has a value of 0.

Copyright:

The Copyright Bit informational parameter sets the value of a single bit within the Dolby Digital bitstream. If this bit has a value of 1 (box checked), the information in the bitstream is indicated as protected by copyright. If it has a value of 0, it is not copyright protected.

RF Ov Prot.:

The RF Over-modulation Protection parameter determines whether or not an RF pre-emphasis filter is used in the overload protection algorithm to prevent RF over-modulation in set-top box decoders.

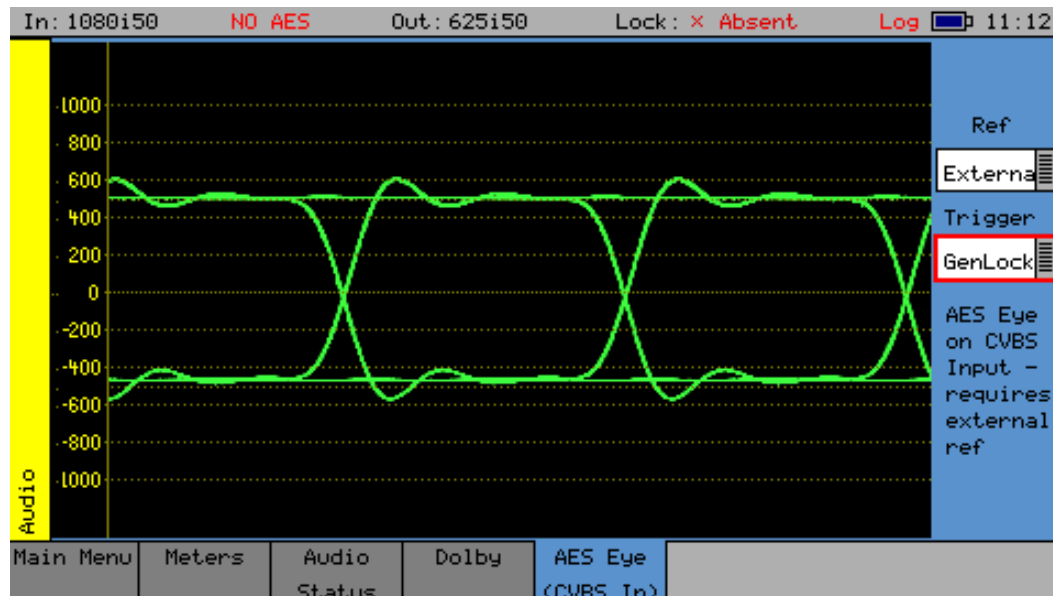
Peak Metering

The peak audio levels are included in the Dolby E metadata packet and may be displayed on the Analyzer-Audio-Meters page. Select the appropriate set of meters to display Dolby levels and then they will follow the selected Dolby E source.

Note: Audio cannot be decoded by the Sx range of products and so you will *not* be able to listen to the Dolby E signal.

See the section [Log Setup - Dolby Status \(PHSXO-DAG\)](#) for details on which changes of Dolby E status may be logged.

AES Eye (CVBS In)



AES Eye menu allows an AES signal of 75 ohm impedance connected to the **PAL/NTSC (AES Eye) In** BNC connector to be displayed as an Eye pattern. This allows the amplitude and quality of the AES waveform to be seen and allows AES-to-reference locking to be checked.

It can be difficult to check that the AES audio signal is correctly locked to the studio reference. The AES Eye menu allows the AES waveform to be displayed on the unit. If the studio locking reference is also connected to the unit, then the AES Eye waveform can be displayed, locked to this reference. If the AES signal is not correctly locked to the reference, then the Eye waveform will run through the display.

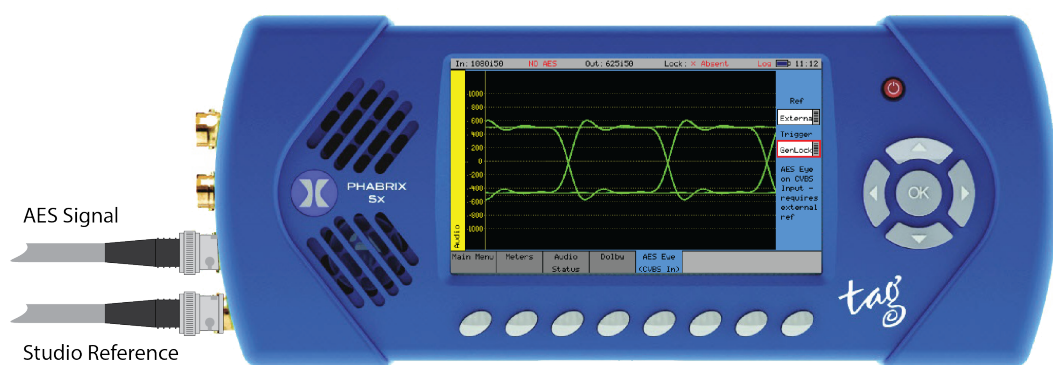
Ref:

Dropdown list allows the reference source to be selected for the AES waveform locking.

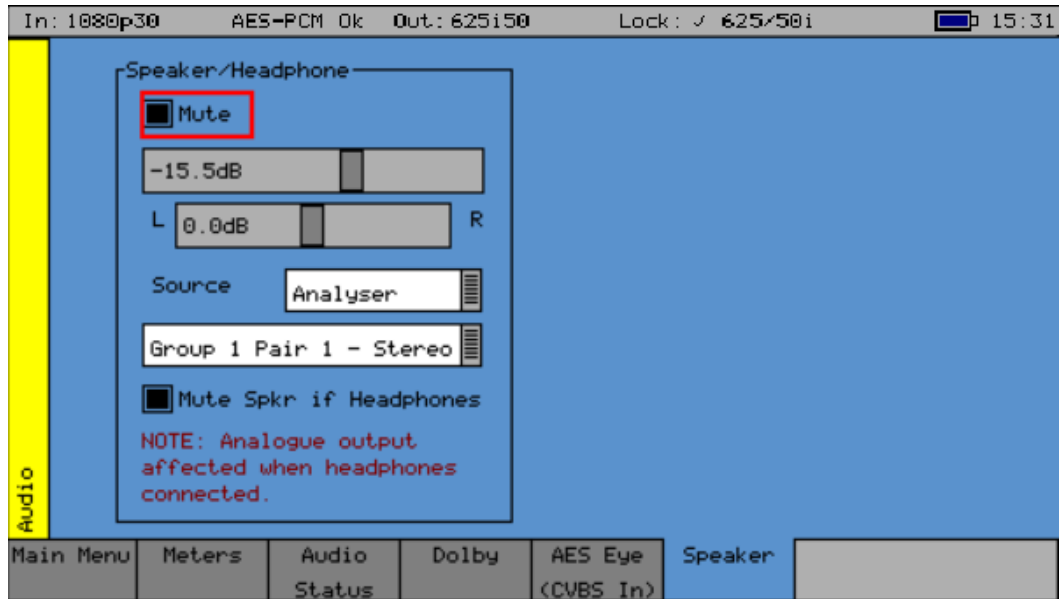
Trigger:

Dropdown list allows the Eye waveform to be triggered either from the AES signal itself (showing the level of jitter), or from the regenerated AES clock itself (showing the waveform without jitter).

The graticule displays ± 1 Volt in 100 mV increments.



Speaker



The **Speaker** menu controls which audio pair can be heard on the loudspeakers and headphone output of the unit.

The Sx TAG instrument is fitted with a loudspeaker and associated stereo headphone socket, which can be connected to any of the audio input or output channels, or pairs.

The **Mute** checkbox allows both signals to be muted.

A volume control is provided to adjust the level of both the speaker and headphones. The balance control can be used to adjust the Left-Right balance for the source being monitored.

The monitored source can be set to the input or output of the Sx TAG and the input and output sources can be set independently to either a stereo pair or single audio channel.

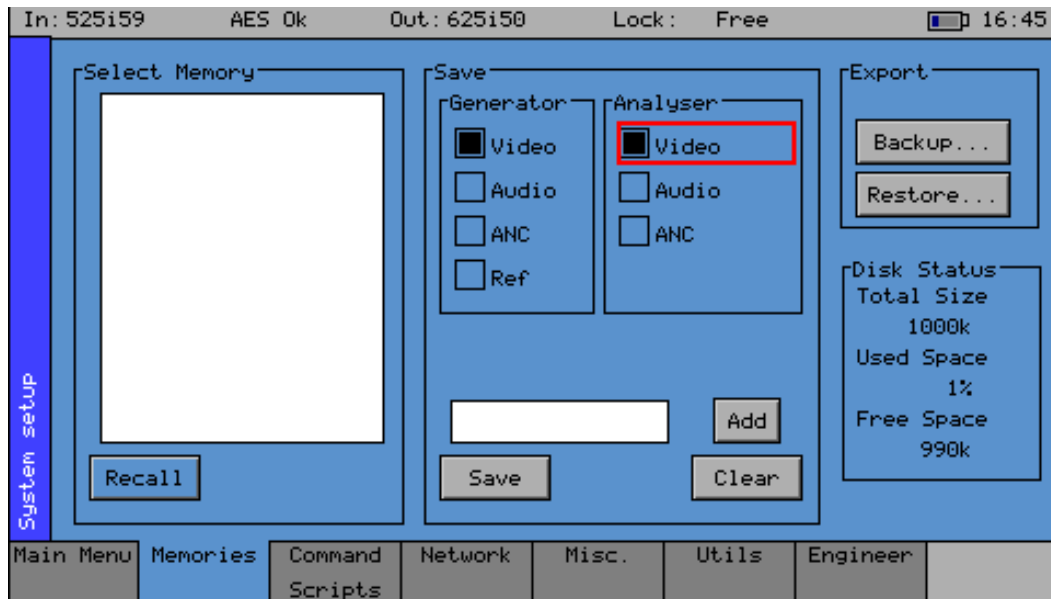
The **Source** dropdown is used to select the specific input that is to be heard.

The speaker can be muted when headphones are plugged in by selecting the **Mute Spkr if Headphones** checkbox.

Note: When listening to an audio source, the Sx instrument needs the audio to be synchronous with that of the Sx Generator. If this is *not* the case, clicks may be heard on the speaker. Either connect the Sx instrument reference to the same reference as the SDI input source and set the **Generator → GenLock → GenLock Source** to **Ref** or **Input-1**.

System Menu

Memories



The **Memories** menu displays the current settings in the Sx instrument, which may be saved for future recall.

The checkboxes on the right-hand side determine what is saved in the memory. Non-overlapping memories may then be combined.

Note: If login has been enabled for an instrument, memories may only be added, edited, renamed or cleared and archives backed-up by a user with **Modify Memories** permissions.

Saving Memories

1. Select the target memory to which to save settings by moving the cursor to the **Select Memory** list and pressing **OK**. Use the Up/Down cursor keys to select an existing memory and then press **OK**. The name edit field next to the memory list will be updated with the name of the selected memory.
2. Specify which aspects of the Sx instrument are to be saved in the memory using the checkboxes on the right-hand side. If you want to change the name of the memory, see the section [Renaming Memories](#) below before saving.
3. Move the cursor to the **Save** button and press **OK**. The text field below the Memory list will change to show the last Saved or Recalled memory.

Recalling Memories

1. Select the memory to be recalled by moving the cursor to the **Select Memory** list and pressing **OK**. Use the Up/Down cursor keys to select the memory and then press **OK**. The name edit field next to the memory list will be updated with the name of the selected memory.
2. Move the cursor to the **Recall** button and press **OK**. The text field below the Memory list will change to show the last Saved or Recalled memory.

Renaming Memories

1. Select the memory to be renamed by moving the cursor to the **Select Memory** list and pressing **OK**. Use the Up/Down cursor keys to select the memory and then press **OK**. The name edit field next to the memory list will be updated with the name of the selected memory.
2. Move the cursor to the edit field and press **OK** to display a keyboard. Use the keyboard to enter the new name of the Memory using the menu keys at the bottom of the screen as required. The **Cancel** key will cancel edit mode and restore the original text. Once you have finished editing the name, press **OK** to rename the memory.

Adding Additional Memories

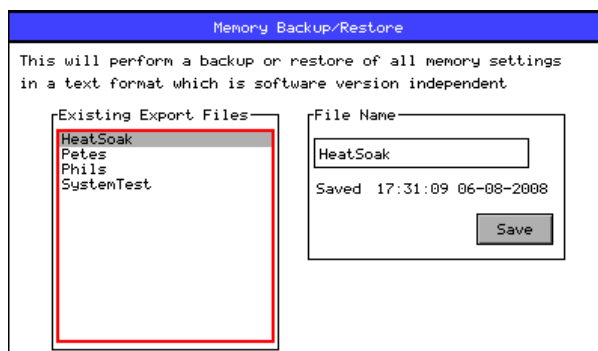
To add a new memory, press the **Add** button. This will use the current memory name and settings.

Clearing Memories

1. Select the memory to be cleared by moving the cursor to the **Select Memory** list and pressing **OK**. Use the Up/Down cursor keys to select the memory and then press **OK**. The name edit field next to the memory list will be updated with the name of the selected memory.
2. Move the cursor to the **Clear** button and press **OK**. The memory list will show the default name for that memory. A cleared memory cannot be recalled.

Exporting Memories

Memories can be exported to a single file for backup purposes and re-imported into the internal format. This allows different sets of memories to be used for different tasks, such as command scripts. Exported memories are in a text format and so may be edited on a PC and downloaded to/from the backups directory on the Sx instrument using FTP or a USB stick.



To export memories, select the **Backup...** button which will open a window to select the file to create. Existing files are shown and a new filename may be selected using the **File Name** edit box. Select the **Save** button to create the backup file. The filename created will have a **.mem** file extension.

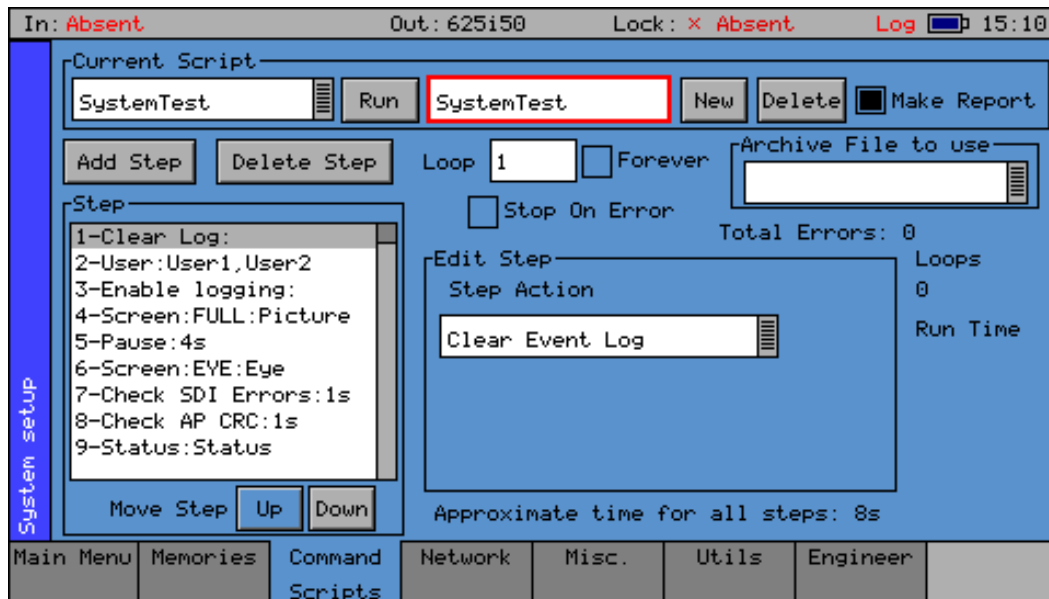
To import memories, select the **Restore...** button which will open a window to select the file to import. Existing files are listed and one should be selected before pressing the **Load** button. Select the **Load** button to import the backup file.

Note: When importing a backup file, all existing memories are deleted before the backup file is loaded so make sure that they are backed-up first.

Disk Status

The **Disk Status** section shows total size of the internal flash disk and the percentages used and free.

Command Scripts (Option: PHSXOS)



The **Command Scripts** menu allows the Sx instrument to run predefined scripts. This can be used to automate testing of signals.

Steps, Actions and Parameters

Command scripts are text files with a file extension of **.cmd**. They are formatted with one step per line. The line is formatted as StepTime, StepAction, StepParameters.

StepTime is a numeric value in seconds 0....n

StepAction is one of:

ARCHIVE:

Used to specify the archive file to be loaded when the script is run. This makes sure that all the memories required for the test have been loaded. The archive file is loaded *everytime* the script is run so if you make changes to any memories you *must* use the Export/Archive section on the System-Memories tab to backup the current memories.

LOADMEM:

Loads the memory specified in the StepParameters field – must be a numeric value 1...num memories.

CHECKERRS:

Check for CRC/EDH/ANC checksum errors in StepTime seconds. If there are any errors an event is added to the event log and the sequence pauses with a message to continue or abort. If the SDI input signal is missing, this is treated as an error.

CHECK_AP_CRC:

Check for changes to the active picture CRC value in StepTime seconds. An event is added to the event log.

PROMPT:

This will put a short prompt on screen in a dialog asking the operator a question and waiting for OK to be pressed to continue. The time field is ignored and the parameter following is the text displayed.

CLEARLOG:

This clears the Event Log

DISABLEEVT:

This disables Event logging

ENABLEEVT:

This enables Event logging

CLEARERRORS:

This clears all error counts (EDH/CRC etc.)

LOGCOMMENT:

Add the specified comment to the log file – useful to document the stage in the test process

PAUSE:

Pause for the specified number of seconds to allow another process such as loading test patterns to complete.

SAVESTATUS:

Save the current system status as an XML file.

SAVEIMAGE:

Save the selected image as a bitmap file in the current scripts directory. Filename must be specified.

SELECTTAB:

Show the selected tab to allow the user to view something.

SEL_USER:

Select user – users are comma separated

CHECK_METER_LEVEL:

This action checks that the level for any visible meters is at the level set by the meter scale. This level may be –18 dB or –20 dB. If the level is over 1 dB greater or less than that value an error will be inserted in the log and report files. If any groups are missing, these will be ignored by the test. Testing may be limited to specified audio pairs as set up on the Log Setup page.

CHECK_METERS_OFF_LEVEL:

This action checks that the level for any visible meters is below –70 dB. If the level is above that value an error will be inserted in the log and report files. If any groups are missing, these will be ignored by the test. Testing may be limited to specified audio pairs as set up on the Log Setup page.

CHECK_AES_INP:

This action checks that the AES input signal is present and has no errors for the specified time period.

Creating Command Scripts

To create a new script:

1. elect the New button. This will create a blank script with the title “NewScript1_”. Select this title and a keyboard will be displayed. Enter the title you require and then select OK to save this title.
2. The first step in the script will be displayed Step Editor window. Use the Edit Step section to select the required Step Action.
3. Select the Add Step function to add a new step to the Script. This will add a new step directly below currently highlighted Step in the Step Editor window.

Editing Command Scripts

To edit the title, select it, enter the title you require and then select **OK** to save this title.

To change the order of the steps within the script, highlight the step to be reordered and then use **Move Step Up/Down**.

Unwanted steps can be removed by highlighting them and then selecting **Delete Step**.

An unwanted Command Script can be deleted by selecting the script (to make it the current script) and then selecting **Delete**.

Running a Script

To run an existing Command Script, select it so that it is the Current Script, and then select **Run**.

Loop:

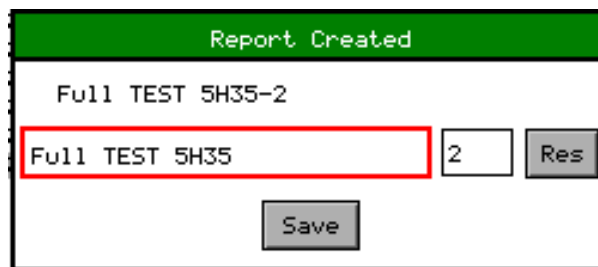
If the **Forever** checkbox is selected, the Command Script will run repeatedly until it is stopped. If the checkbox is not set, the number of repeats can be set.

Stop on Error:

If the **Stop on Error** checkbox is selected, the script will stop if an error is encountered.

Make a Report:

If the **Make a Report** checkbox is selected, a report will be generated with the results of the Command Script when it is run.

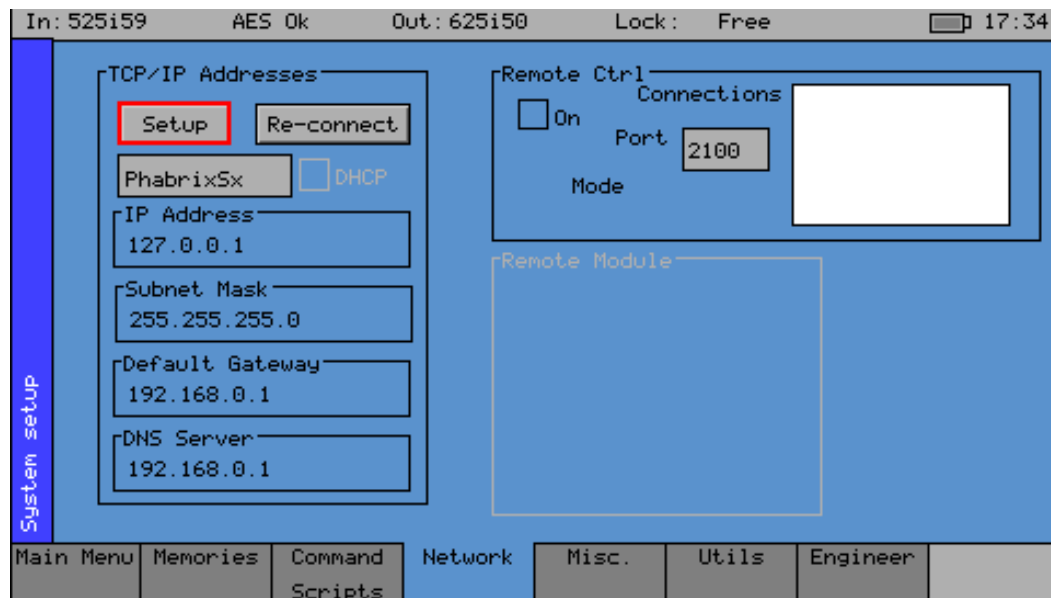


When the report is created its title can be edited by selecting the title and using the keypad.

The report can also be numbered automatically using the auto-increment value to the right of the report title. Subsequent reports will have the same but will have an incremental number.

The **Res** (reset) button can be used to reset the number to 1.

Network



PHABRIX Sx is fully network compatible and has a complete network interface to allow control of any Sx instrument from any other unit.

The **Network** menu allows the Sx instrument to be configured as part of a network.

Note: If the Sx instrument is switched on without the network connected, you will have to select **Re-connect** button to set networking up correctly. This is because the Ethernet connection auto-senses whether it has to swap the cable over, which means that you can use any Ethernet cable with the Sx instrument, but it also requires the Ethernet connection to be present when starting up.

If the **DHCP** checkbox is enabled, then the Sx instrument will automatically attempt to request an IP Address from any network to which it is connected, as long as a DHCP server is available on the network.

If your network uses static (nonchanging) addresses, you will need to contact your network administrator to get an address assigned to your instrument, and to get the Subnet mask and default gateway address. To edit the settings, select **Setup**. These details can then be entered in the corresponding boxes in the menu. If the **DHCP** checkbox is enabled, these values will not be editable. Select each numeric box in turn and use the up and down cursors to pick the required value. When the IP Address, Subnet Mask, Default Gateway and DNS Server values have been setup, use **Re-connect** to attach the Sx instrument to the network.

Remote Automation Control of Sx Instrument (Option: PHSXOR)

To allow remote control of an Sx instrument for automation, you must have set, the TCP/IP address of the instrument, and the **Remote Ctrl On** checkbox must be selected.

The list box shows a list of current connections made to the instrument. This includes the web browser connection (127.0.0.1) which may be seen intermittently as the web browser connects every few seconds and then disconnects again. See the remote control documentation available for download, for more information on the protocol and method of control.

The Sx instrument uses a default Port number of 2100 for remote control access. (See Remote Control SDK documentation of the PHABRIX website **Support → Software Downloads → PHABRIX Utilities**) This port number may now be changed if it conflicts with other applications in your system.

Misc

The screenshot displays the 'Misc' menu of the PHABRIX Sx TAG. The top status bar shows 'In: 525i59', 'AES Ok', 'Out: 625i50', 'Lock: Free', and a battery icon with '17:35'. The main menu is divided into several sections: 'Unit Details' (SerialNo: PetesUnit2, Version: 0.10.0026, H/W Rev: ?? ID: 1.4, U-Boot: 1.1.6, Mar 12 2009 12:11:22, Linux: 2.6.x, Mar 09 2010 17:20:49), 'Battery Status' (State: Suspended), 'MAC Address' (12:34:56:78:9a:bc), 'Date & Time' (2010 3 9 17 35, Format, Change checkbox, d-m-y dropdown), 'LCD Brightness' (slider at 15, highlighted with a red box), 'Saver' (10 Mins dropdown), 'Language' (English dropdown), 'Option Security Code' (<No Options>), and 'System Options' (Remote Control, Signal Data View, Command Scripts, Zone Plate, Dealer Demo Unit, Enh. Eye/Jitter, Extra Video Formats). A vertical 'System Setup' label is on the left. The bottom navigation bar includes 'Main Menu', 'Memories', 'Command Scripts', 'Network', 'Misc.' (selected), 'Utils', and 'Engineer'.

The **Misc.** menu shows serial numbers, Sx instrument MAC address, version information and battery state. It also allows the date and time to be set and factory default settings to be recalled. The **Options Security Code** is entered on this page to activate purchased options.

Changing the Date/Time

Select the **Change** checkbox under the date and time fields and then use the cursor to modify the date and time. Press **OK** to edit a field and again to complete the change. When all fields have been edited, deselect the **Change** checkbox and the new date and time will be set.

Note: The date may not be changed while a 30-day trial option is active.

Changing the Date Format

The date format used on logging screens, etc. can be set using the **Format** selection dropdown. The following formats are available:

- Day-Month-Year (**d-m-y**)
- Month-Day-Year (**m-d-y**)
- Year-Month-Day (**y-m-d**)

Setting the LCD Brightness

Use the **LCD Brightness** slider to set the LCD brightness, using a lower brightness will reduce the current drawn from the battery and help to extend the battery life.

Setting Screen Saver Mode

When the unit is battery-powered the screen saver will operate after a user-defined time period and reduce the LCD brightness down to its lowest level. This will help to extend the battery life. Pressing any key will restore the previously set LCD brightness. The screen saver start time, defining the period when the screen is not in use, can be adjusted in the **Saver** dropdown.

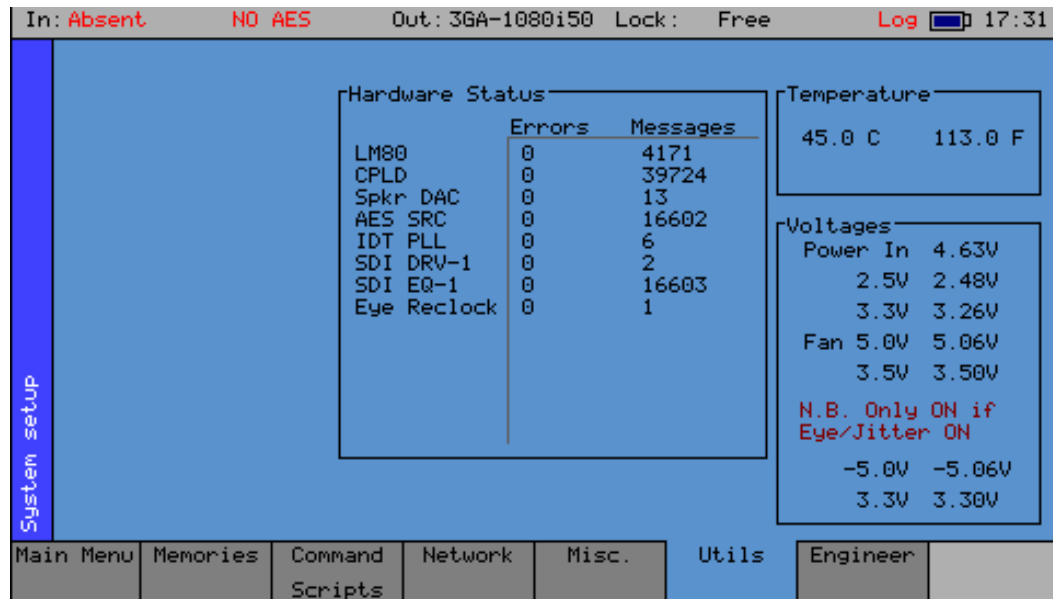
Setting User Language

The language used to display the menus may be changed to one of the supported languages. Currently only English is supported.

Changing Options Security Code

When new options are purchased for the Sx instrument a new Security Code will be supplied. This is specific to the unit and cannot be used on other units. The security code is entered into the **Option Security Code** field below the **System Options** list, and is edited by pressing **OK** and using the keypad and function buttons. If an incorrect Security Code is entered, a dialog will be displayed. The new Security Code will only be saved if it is valid; the old code will be used until a valid code is entered. Once a valid new code has been entered, the list of options provided by that code will be displayed. The options code is stored independently of memories and system settings.

Utils



The **Utils** menu displays details of the instrument's operating status and displays the temperature and individual voltages. This menu also allows you to disable selected options.

Dealer Features

This section of the menu details the features that can be used by suppliers of the Sx instrument.

Show Options:

This checkbox, if selected, will enable the features throughout the menu system.

Enable:

This checkbox, if selected, allows options to be cleared from the Sx instrument.

Clear Option:

This function, when pressed, will remove the selected options from the Sx instrument.

Hardware Status

This section of the menu shows any hardware errors that have been recorded by the Sx instrument. If the error count is greater than 0, contact your local dealer for advice.

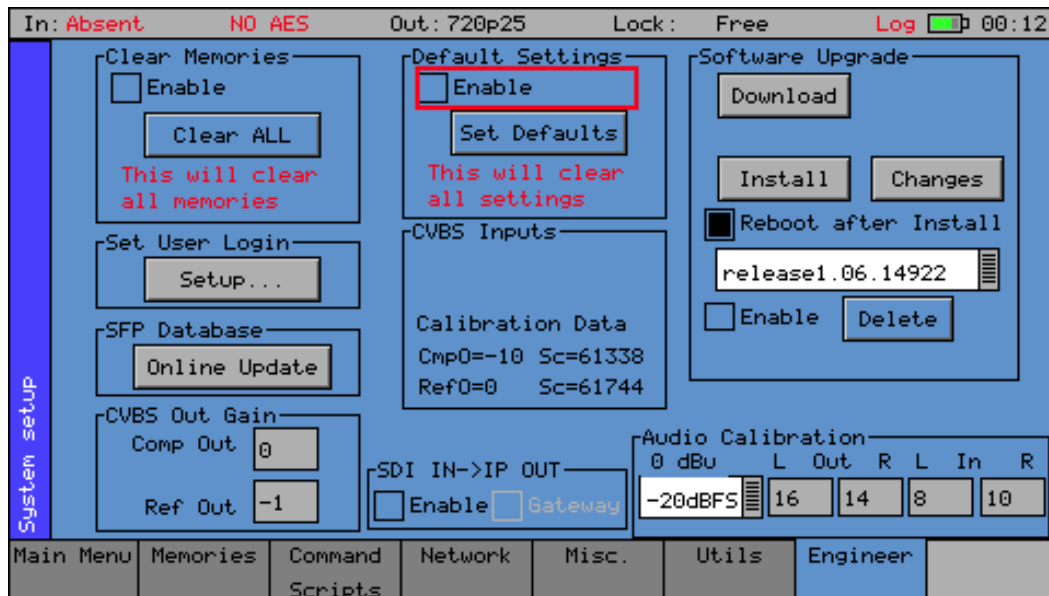
System Temperature

This section of the menu displays the current Sx instrument temperature. This information is provided for diagnostics purposes only.

Voltages

This section of the menu displays the current voltages for the currently selected board in the **Board** section of the menu. This information is provided for diagnostics purposes only.

Engineer



The **Engineer** menu is used to manage the unit and allows user access to be setup and the installation of new versions of software.

Clear Memories

This section of the menu allows the defined users who can access the Sx instrument to be cleared. To use this function, select the **Enable** checkbox and press **Clear ALL**. This will delete all of the user memories.

Default Settings

This section of the menu allows you to reset the Sx instrument to its default factory settings. To do so, select the **Enable** checkbox and press **Set Defaults**. The factory defaults will be recalled. This will not affect the system Security Code or Free Run frequency.

SDI In -> SFP Out

If an appropriate SFP output module is installed, the **Loop** checkbox in the **SDI IN -> SFP OUT** section of the **Engineer** menu, allows the video signal on the **SDI In** BNC to be looped through to the SFP Output connector. In this mode the Generator menu will be disabled.

Select **Enable** followed by **Loop** to select this mode of operation.

For a transceiver SFP module, first select **SDI IN -> SFP OUT** from the dropdown menu.

Note: For this mode of operation, make sure that the SDI BNC in Main Menu is set to **SDI In**.

SFP In -> SDI Out

If an appropriate SFP input module is installed, the **Loop** checkbox in the **SFP IN -> SDI OUT** section of the **Engineer** menu, allows the video signal on the SFP Input connector to be looped through to the **SDI Out** BNC. In this mode the Generator menu will be disabled.

Select **Enable** followed by **Loop** to select this mode of operation.

For a transceiver SFP module, **SFP IN -> SDI OUT** should first be selected from the dropdown menu.

Note: For this mode of operation, make sure that the SDI BNC in Main Menu is set to **SDI Out**.

Gateway Mode

Gateway mode is an important system feature of the Sx TAG IP that provides a convenient bridge between IP and SDI.

When Gateway mode is enabled, all instrument sources are automatically switched to the appropriate source and user selection is grayed-out.

Encap: SDI In -> IP Out

If the PHABRIX IP SFP module (**PHSFP-10SR-IP**) is installed in **Encap** mode, the **Gateway** checkbox in the **SDI IN -> IP OUT** section of the **Engineer** menu, allows the video signal on the **SDI In** BNC to be looped through to the IP Out SFP connector. In this SDI-to-IP conversion mode, the Generator menu will be disabled.

Select **Enable** followed by **Gateway** to select this mode of operation.

Note: For this mode of operation, first make sure that the SDI BNC in Main Menu is set to **SDI In**.

Note that the **Output – SFP** checkbox in the **Generator → Video Out** menu, is tied to the **Flow Enable** checkbox in the **2022-6 Encap** menu, and can be used to enable or disable the flow.

Decap: IP In - SDI Out

If the PHABRIX IP SFP module (**PHSFP-10SR-IP**) is installed in **Decap** mode, the **Gateway** checkbox in the **IP IN -> SDI OUT** section of the **Engineer** menu, allows the video signal on the **IP In** SFP connector to be looped through to the **SDI Out** BNC. In this IP-to-SDI conversion mode, the Generator menu will be disabled.

Select **Enable** followed by **Gateway** to select this mode of operation.

Note: For this mode of operation, first make sure that the SDI BNC in Main Menu is set to **SDI Out**.

Note that the **Output – SDI** checkbox in the **Generator → Video Out** menu, is tied to the SDI I/O control in **Main Menu**. These can be used to enable or disable the SDI output.

SFP Database

This function allows the Sx TAG to download SFP Database updates for new SFPs that are not yet recognized by the unit.

When an SFP module type unknown to the unit is inserted, a prompt window will state that the SFP is not recognized, will display the vendor ID and SFP type, and tell the user to contact PHABRIX Support.

Contact PHABRIX Support with the vendor ID and SFP type details.

For an internet connected Sx TAG with the SFP inserted, pressing **Online Update** will prompt the unit to contact the PHABRIX website to check for any updates. This process will be displayed in a prompt box. If a database update for the SFP type is found, the unit will automatically download and install it. The prompt box will indicate once the SFP Database update is complete and the SFP will be ready to use.

Note: Installing a newer version of Sx TAG software will also update the unit to recognize any new SFP types now supported by PHABRIX.

Set User Login

User access can be setup for the Sx instrument by adding users to the system. With User log-in enabled, a log-in screen will be displayed when the Sx instrument is switched on. This will then require a valid user and password to be entered. Each user has an encrypted password and permissions which may be set.

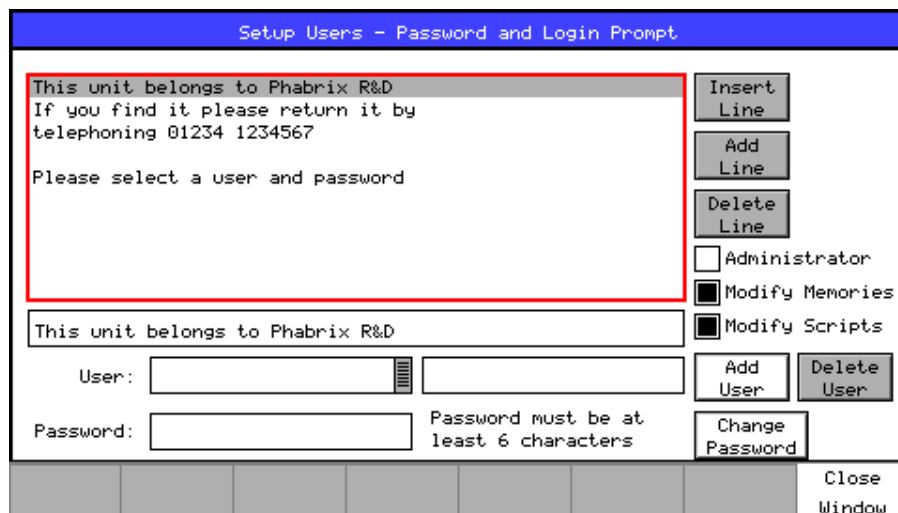


The screenshot shows a login screen titled "Select User and Password". It contains the following text: "This unit belongs to Phabrix R&D", "If you find it please return it by telephoning 01234 1234567", and "Please select a user and password". Below this, there are input fields for "User:" (containing "Pete") and "Password:". A "Log In" button is located at the bottom center.

Using the User Login feature allows the Sx to be protected from unauthorized operation of the Front Panel controls. The prompt feature can allow a message to be displayed so that if the Sx instrument gets lost or stolen, someone finding it knows where to return it.

Adding/Deleting Users

Add a user by editing a new name in the **User Edit** box next to the **Add User** button and then entering a new password. Once the password is **six** characters or longer, the **Add User** button will become enabled and may be pressed. Make sure that your password is memorable. If all passwords to an Sx instrument are forgotten, you can contact Phabrix for an override password. Users with administrator permission may add/delete users.



The screenshot shows a configuration screen titled "Setup Users - Password and Login Prompt". It features a large text area on the left containing the login prompt text: "This unit belongs to Phabrix R&D", "If you find it please return it by telephoning 01234 1234567", and "Please select a user and password". To the right of this area are buttons for "Insert Line", "Add Line", and "Delete Line". Below these are checkboxes for "Administrator", "Modify Memories", and "Modify Scripts". At the bottom, there are input fields for "User:" and "Password:", a "Change Password" button, and a "Close Window" button. A note states "Password must be at least 6 characters".

Once user login has been set up on your Sx a **Log out** button is added to the main menu which displays a Login screen. This may be used to protect systems settings from being modified by other users. The system is still operating while the login screen is visible.

The user permissions are as follows:

Administrator:

Add/delete users and also edit the Login prompt text.

Modify Memories:

Create, save and delete memories and Archives.

Modify Scripts:

Create, save and delete script files (if the command scripting option has been purchased.)

Each user may modify their own password by entering a new password (six or more characters) and pressing **Change Password**.

If all users are deleted, the Sx instrument reverts to starting up without a login screen.

Editing the Prompt Text

The simplest way to edit the prompt text is to FTP a prompt text file named **loginprompt.txt** (all lower-case) onto the Sx instrument. The instrument should then be re-started to initiate the new file.

Users with administrator permissions can also edit the prompt text. To do so, select a line in the prompt text list, then press **OK** to edit in the line edit field using the text keyboard.

Add a new blank line after the selected line by pressing **Add Line**.

Insert a new blank line above the selected line by pressing **Insert Line**.

Generator Free-Run

Press the **Calibrate** button to calibrate the free-running frequency using the External reference or Video Input as selected by the **Generator → GenLock** page. If no input is present, or the Generator is free-running, an error dialog will be displayed. The calibration will take a few seconds to complete, at which point the calibration value will be displayed. This calibration value is not lost when memories are cleared, or when factory defaults are restored.

Software Upgrade

Note: Make sure that the unit is connected to an AC power source before starting the software upgrade. The software upgrade may take up to an hour to complete.

This section allows new Sx software versions to be installed. The instrument may download and install new versions of software when available in a two stage process:

1. To download the latest software version, make sure that the network settings are correct and that the Sx instrument is connected to the internet over the Ethernet connection.

Pressing the **Download** button will cause the current release of software to be downloaded from the PHABRIX website. This can take a short time dependent on the connection to the internet. Once the download has completed, the software will be checked for errors before being stored on the Sx instrument for future installation. If the latest software is already present on the Sx instrument, no software will be downloaded and a message will be displayed. Note that the unit should be connected to the AC adaptor so that the battery state does not affect the installation process. Also note that multiple releases of software may be stored on the Sx instrument so that a previous release can be re-installed if required.

2. To install the downloaded software on the Sx instrument, select the desired release in the available listing. The latest release will have the highest number. Select **Install** and a confirmation dialog will be displayed. Press **Yes** to start the installation. This process takes several minutes to decompress the software, extract the files and then reprogram the hardware. If an error occurs during installation, retry the installation and/or download. Do *not* switch off the Sx instrument until an installation has completed correctly.

Once the installation has completed, if the checkbox **Reboot after Install** is selected the Sx instrument will restart with the new software installed. If not selected, then the instrument should be switched off and on again manually.

Note: As part of the installation process, all memories are archived to a backup file and then deleted. They can be restored from the **Memories** page using the **Restore...** button and selecting the archive labeled **_Before_Upgrade**.

The software release notes can be viewed by selecting the **Changes** button.

CVBS Out Gain

This section is used to calibrate the analog composite and reference video output levels. These levels are factory set.

CVBS Inputs

This section is used to calibrate the analog composite and reference video input levels. These levels are factory set.

Audio Calibration


This section is used to calibrate the balanced audio input and output levels. These levels are factory set. The dBFS level with reference to 0 dBu, can be adjusted in the dropdown menu.

Logging Menu

Overview

Logging allows events to be detected and recorded for future examination. The events to be logged can be specified so that unwanted events do not appear in the event log. If a system has a problem with intermittent signals, the Sx instrument can be connected to that source and can be left for several days to log any errors. At the end of that period the log can be examined and the time and date of each error noted.

Events Log

In: Invalid		AES-PCM Ok	Out: 1080p25	Lock: X	Inp-1	Log  12:17
Logging	Time	Date	Event	4453 of 4453 Event(s)		
	C 12:17:49	29-08-2012	Signal OK state changed: 0■			
	E 12:17:49	29-08-2012	Input 1 Std: Absent			
	E 12:17:51	29-08-2012	Ref. Unlocked Absent			
	C 12:17:53	29-08-2012	RemCtrl: Client Connection			
	E 12:17:55	29-08-2012	Ref. Unlocked Inp-1			
	E 12:17:55	29-08-2012	Input 1 Std: 1080p25 YCC422-10			
	C 12:17:55	29-08-2012	Signal OK state changed: 0■			
	C 12:17:55	29-08-2012	Signal OK state changed: 0■			
	C 12:17:55	29-08-2012	Signal OK state changed: 0■			
	E 12:17:56	29-08-2012	Input 1 Std: Absent			
	E 12:17:58	29-08-2012	Ref. Unlocked Absent			
	E 12:18:01	29-08-2012	Ref. Unlocked Inp-1			
	E 12:18:01	29-08-2012	Input 1 Std: 1080p25 YCC422-10			
	C 12:18:01	29-08-2012	Signal OK state changed: 0■			
	C 12:18:01	29-08-2012	Signal OK state changed: 0■			
	C 12:18:01	29-08-2012	Signal OK state changed: 0■			
	E 12:18:02	29-08-2012	Input 1 Std: Absent			
Main Menu		Events	Log Setup	Log Eye	Log ANC	
				Jitter	Status	
			Add Mark		Clear Log	
			in Log			

The **Events** menu displays a list of events with a time stamp showing when they occurred.

Entries in the Event Log are classified according to their severity with an initial letter as follows:

- **C:** Control (change of state)
- **E:** Event
- **I:** Information
- **W:** Warning

Pressing the **OK** button on the front panel when the highlight is on the event log page allows the event log to be scrolled to view all events in the list. The currently selected event is shown on the event log header. The date format may be changed using the date **Format** dropdown on the **System** → **Misc** page. The event log may be cleared by pressing **Clear Log**; a confirmation dialog will be displayed. A date-stamped *mark* may be inserted into the event log to allow users to see when a test started or when a significant event occurred using the **Add Mark in log** button.

Note: The event log displays only changes in status, so if the input is always in error and never good, an event will not be recorded. To obtain a view of the complete state of the instrument requires reviewing the current status in addition to the event log.

Log Setup

In: 1080i50		Out: 1080i50		Lock: ✓ 625/50i		Log		p 11:39	
Audio Thresholds									
	Level	Time (s)							
Clip	-2dBfs	0.1	<input type="checkbox"/> Log						
High	-10dBfs	0.1	<input type="checkbox"/> Log						
Quiet	-40dBfs	10.0	<input type="checkbox"/> Log						
Muted	-82dBfs	10.0	<input type="checkbox"/> Log						
Pair:	1	2	3	4	5	6	7	8	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Dolby-E Status									
<input type="checkbox"/> Errors		<input type="checkbox"/> Common MetaData							
<input type="checkbox"/> Timing		<input type="checkbox"/> Program MetaData							
Video Status									
<input type="checkbox"/> Output Standard									
<input type="checkbox"/> Reference Status									
<input type="checkbox"/> Input Status									
<input type="checkbox"/> EDH/CRC									
<input type="checkbox"/> TRS Errors									
<input type="checkbox"/> Picture CRC									
<input type="checkbox"/> SMPTE 352 Errors									
Logging									
<input type="checkbox"/> Enable									
<input type="checkbox"/> Beep									
<input type="checkbox"/> Sys Errors									
<input type="checkbox"/> System Info									
<input type="checkbox"/> Battery									
<input type="button" value="Clear"/>									
<input type="button" value="Save"/> <input type="checkbox"/> CSV									
<input type="button" value="Log Time Limit"/>									
<input type="checkbox"/> Enable									
<input type="button" value="Start"/>									
<input type="button" value="End"/>									
Main Menu Events Log Setup Log Eye Jitter Log ANC Status Add Mark in Log Clear Log									

The **Log Setup** menu allows specific events to be tracked by the Sx instrument.

Note: The events to be logged are set-up on this page by checking the appropriate **Log** checkboxes.

Audio Thresholds

This section allows the thresholds for audio events to be set. If the audio level for a channel is higher than that specified in the **Clip** or **High** fields for the number of seconds specified, then an event will be added to the event log. If the audio level for a channel is lower than that specified for the **Quiet** or **Muted** fields, then an event will be added to the event log. Logging may be limited to specified audio pairs.

Video Status

This section allows specific video status events to be logged:

Output Standard:

A log event will be added whenever the generator video standard changes.

Reference Status:

A log event will be added whenever the external reference standard changes or the external reference input is lost or re-appears.

Input Status:

A log event will be added whenever the input video standard changes or if the input is lost or re-appears.

EDH/CRC:

A log event will be added whenever an EDH/CRC error state changes. If the EDH/CRC state is correct, the event will show OK, else it will show FAIL. Separate Luma and Chroma CRC events may be shown. Note that EDH/CRC events may occur when an SDI signal is connected or removed.

TRS Errors:

If the number of lines changes or line length changes during a frame, the input video will be detected as the TRS changing and an event logged. If the signal continues changing only a single event will be logged. If the SDI signal has a static line count and line length for five seconds, a TRS OK event will be added to the log. This reduces the number of log events for a bad SDI signal.

Picture CRC:

This should only be used for static single-frame test patterns (do not use for Zone Plate, dynamic broadcast signals or Checkfield/Pathological test patterns which are two frames long at HD). This can be used to log changes in the CRC for the active picture (a unique value for each test pattern). If the CRC changes and was previously OK an error is added to the event log. If the CRC is the same as the last frame for five seconds an OK event will be added to the event log. If the active picture CRC is continuously changing, therefore, only one event will be entered in the log until the picture remains static, at which point an OK event will be added.

AES Status

This section allows AES audio errors to be logged:

Errors:

A log event will be added whenever the embedded audio error status changes. This may be due to a Data Block Number error, ECC error or phase error status change. The event entry will detail which state has changed.

Input Status:

A log event will be added if the AES signal disappears or appears.

Dolby Status (PHSXO-DAG)

This section allows Dolby errors to be logged.

Errors:

Will add an event to the event log when a Dolby input stream is detected or lost. An event will also be added if a CRC error is detected in the Dolby metadata stream. If an error is detected in the Dolby E stream, it may mean that the Dolby E stream has not been synchronized with the embedded audio clocks.

Timing:

Will log if the Dolby E frame timing is outside the Dolby-specified Ideal range. A Warning event will be given if the signal is OK but slightly outside the range and an Error event if it is on an invalid line.

Common Metadata:

Will log any changes of the common metadata (Program Configuration, Bit Depth, Frame Rates.)

Program Metadata:

Will log any changed program metadata. This can be useful for following changes to a program stream over a long period of transmission.

SFP

This section allows specific SFP information to be logged:

Status:

A log event will be added when a user changes an IP SFP parameter on a 2022-6 Menu. For example, if a user changes the Flow Source IP address, an event log will be added detailing the new IP address. A log event will also be added when there is a change of the video format being processed by the IP SFP.

Pkt Counts(1 Minute):

Log events are added each minute for the sent or received Flow packet count, and the IPv4 Ethernet packet count.

Logging

This section controls all logging events:

Clear:

Clears all entries in the event log.

Enable:

Enables the logging process. If this is not checked, no events will be added to the log. This is a simple method of turning off all logging temporarily.

Beep:

Causes the Sx to emit a short tone when an Event is added to the log. Note that the beep will occur even if the Speaker is set to **Mute**.

SYS Errors:

Allows system errors to be displayed in the Event Log if they occur. If you are having problems with your Sx, checking this box can add events that may help PHABRIX to determine the nature of the problem.

System Info:

Allows the system to report additional internal messages in the Event Log if they occur. If you are experiencing problems with your Sx instrument, checking this box can add events that may help PHABRIX to determine the nature of the problem.

Save:

Saves the current event log to a text file in the currently specified language. The log file created, **logfile.txt** may be downloaded using an FTP connection. If the **CSV** checkbox is selected then a comma separated value file will be created.

Log Time Limit

The time when logging is enabled may be restricted by the time of day. Logging will start at the specified start time and end at the specified end time. The specified times must be after the current time. Uncheck the **Enable** checkbox to log at all times. Logging must be enabled using the checkbox above for this to work.

Log ANC Status

In: 362-1080p30 Out: 362-1080p30 Lock: Free Log 15:23

Select All Select Active Clear All Setup Reset

☐ RP165-EDH ☐ S272-SD Audio ☐ S272-SD Aux ☐ S272-SD Ctrl
☐ S299-HD Audio ☐ S299-HD Ctrl ☐ S315-Cam. Pos. ☐ S353-MPEG Recod
☐ S305-SDTI ☐ S348-HDTI ☐ S427-Lnk.Enc 1 ☐ S427-Lnk.Enc 2
☐ S427-Link Enc ☐ S352-Payload ☐ OP47 Transport ☐ OP47 Dist.
☐ ITU-R BT 1685 ☐ RP214-KLV-V ☐ RP214-KLV-H ☐ RP223-UMID/ID
☐ S2020-Audio ☐ RP215 - Film ☐ EIA-708 Caption ☐ EIA-608 Caption
☐ RP207 - Program ☐ RP208 - VBI ☐ S2010-SCTE MSGS ☐ S2016-3 AFD
☐ ARIB-B.22 ☐ ARIB-B.23-1 ☐ ARIB-B.23-2 ☐ ARIB-B.27 Capt.
☐ ARIB-B.35 ☐ ARIB-B.39 ☐ ARIB-B.37 Ana ☐ ARIB-B.37 HD
☐ ARIB-B.37 Mob. ☐ ARIB-B.37 SD ☐ S2031-SCTE VBI ☐ S2016-4 PAN
☐ RP196-HANC ☐ S12M-2 V-TCODE ☐ RDD8-WSS ☐ RP196-VANC
☐ Mark Deleted ☐ ☐ ☐

Main Menu Events Log Setup Log Eye Jitter Log ANC Status Add Mark in Log Clear Log

The Log ANC Status menu allows customization of which ANC packets to log for changes in status (e.g., Present, Checksum Error, Missing, Parity Error). Individual checkboxes are provided to determine which packet DID/SDID combinations are logged.

Select All:

Selects the checkboxes for all packets (toggle).

Select Active:

Selects the checkboxes for all packets currently present.

Setup:

Allows the user to define and name their own DID/SDID values for an ANC packet type.

Configure User DID/SDIDs

User ANC Packets	DID	SDID	Stream
User-1	0	0	VI-1(C)
User-2	0	0	VI-1(C)
User-3	0	0	VI-1(C)

Close

Reset:

Clears the state for all packet types so that a packet that was displayed previously as in error is shown as OK.

IP Functions

Overview

This section describes the four modes available on the Sx TAG for SMPTE 2110 and 2022-6 IP Encapsulation (Encap, transmission), or Decapsulation (Decap, reception). The section also includes information on the remote management of the IP SFP, and details of the SDI-to-IP and IP-to-SDI Gateway function using the Sx TAG.

If the Sx TAG instrument has the IP License option (PHSXO-IP) installed in conjunction with the PHABRIX IP SFP option (PHSFP-10SR-IP), it can transmit or receive SMPTE ST 2110 or 2022-6 IP streams and convert from SDI-to-IP or IP-to-SDI. See the section [System - Engineer: Network](#) for details on how to control the SDI-to-IP or IP-to-SDI Gateway function.

The PHABRIX SFP option (PHSFP-10SR-IP) provides four different boot modes as follows:

- SMPTE ST 2022-6 Encap v4.6.1561 with ST 2022-7 SIPS and LLDP
- SMPTE 2022-6 Decap v4.7.2360 with ST 2022-7 SIPS and LLDP
- SMPTE ST 2110-20/30/31/40 Encap v3.7.4011 with 2022-7 SIPS, ST 2059 PTP, NMOS, Audio shuffle and LLDP
- SMPTE 2110-20/30/31/40 Decap v3.7.4015 with 2022-7 SIPS, ST 2059 PTP, NMOS, Audio shuffle and LLDP.

In SMPTE ST 2022-6 systems the video, audio and ANC elements are all carried within one encapsulated video stream. This can be thought of as an encapsulated SDI stream. The video format can be autodetected in the same way that it is detected in SDI based systems.

In SMPTE ST 2110 systems the video, audio and ANC flows are separated out into separate individual streams. The Sx TAG Encap can autodetect the video format from the SDI source, and the parameters of the Audio and ANC channels such as the number of audio channels per stream and the associated audio packet time is configured as part of the Encap set-up process.

Note: SMPTE ST 2110 decap does not have the facility to autodetect the video format or the audio configuration. These parameters must either be entered manually using the Configuration Set-up Popup menu, or by receiving a Session Description Protocol (SDP) record under in-band NMOS control.

A system using SMPTE ST 2022-7 Seamless IP Protection Switching (SIPS) has a twin pair of redundant streams from which a single error free output stream can be reconstructed using seamless protection switching at the RTP datagram level. Consequently, an error-free output can be reconstructed if a packet is in error on one of the streams but not the other. The Encapsulator sends two identical streams and the Decapsulator receives two streams. These may be on a single physical port or 'air-gapped' using two different physical ports. The Sx TAG provides ST 2022-7 over a single physical interface, and in this version of software 2022-7 reconstruction is enabled.

The PHABRIX IP SFP supports the following number of media streams/flows:

- **2022-6 Encap:** One Video 2022-6/2022-7 flow pair
- **2022-6 Decap:** One Video 2022-6/2022-7 flow pair
- **2110 Encap:**
 - One Video 2110-20/2022-7 flow pair
 - Eight Audio Flows of 2022-7 pairs, where each flow pair can be either 2110-30 (PCM) or 2110-31 (AES 3)
 - One ANC 2110-40/2022-7 flow pair.
- **2110 Decap:**
 - One Video 2110-20/2022-7 flow pair
 - Four Audio Flows 2022-7 pairs, where each flow pair can be either 2110-30 (PCM) or 2110-31 (AES 3)
 - One ANC 2110-40/2022-7 flow pair.

SMPTE ST 2059 is a profile of IEEE standard 1588-2008 Precision Time Protocol (PTP) and is the replacement in IP systems for analog Black and Burst or Tri-syncs. PTP systems send timestamp information between a PTP Leader and a PTP Follower such as the PHABRIX IP SFP in the Sx TAG. From these timestamps the PTP Follower reconstructs the PTP clock and time of the PTP Leader. The SFP accepts in-band PTP traffic over the multimode fibre, no external connection is required.

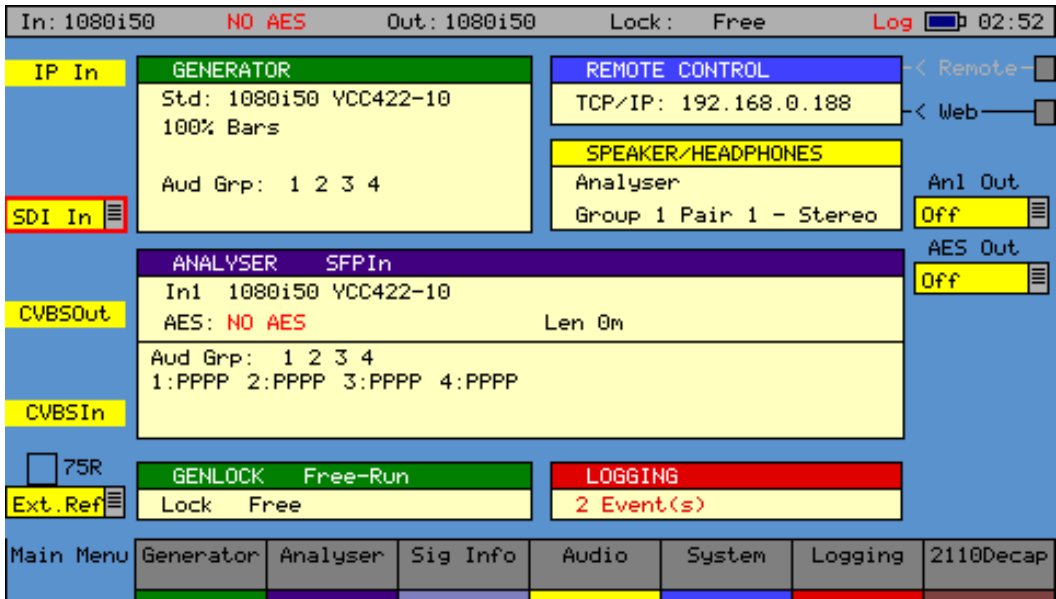
Networked Media Open Specifications (NMOS) family of specifications have been developed by the Advanced Media Workflow Association (AMWA) to provide a control and management layer, in addition to the transport layer provided by SMPTE ST 2110. The PHABRIX IP SFP supports NMOS IS-04 v1.2 Discovery and Registration, IS-05 v1.0 Device Connection Management and IS-08 v 1.0.1 Audio Channel Mapping.

Audio Shuffle is achieved in 2110 Decap and Encap modes by an internal audio channel matrix. Up to 16 audio channels are supported for each of the four audio streams (Decap) or eight audio streams (Encap) , and these can be individually mapped into any of the 16 SDI audio channels. In 2110 systems the audio is routed separately, as controlled either by the Sx TAG or the IS-08 REST API, so that audio media from several sources can be brought together in the decapsulator.

Link Layer Discovery Protocol (LLDP) is a link layer protocol used by network devices for advertising their identity, capabilities and neighbors. This tool is a useful, in-band method of identifying what the port and device is connected to at the other end of a wired Ethernet link on a local area network.

SFP Mode

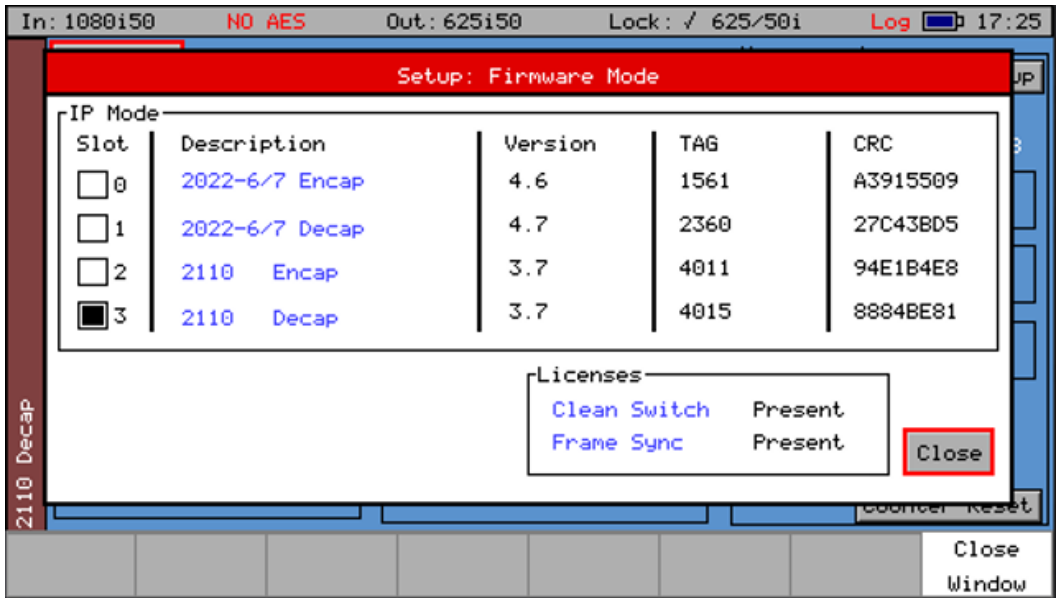
The Sx TAG automatically detects the boot mode of the IP SFP on power-up and automatically configures the user interface to match the SFP mode. The detected IP SFP mode is displayed in the right-hand button of the Main Menu:



This is also displayed in the navigation bar at the left-hand side of each sub menu under that tab.

The SFP Boot mode is selected using the IP SFP Mode selection popup in the **SFP Setup** screen (see SFP Mode in the Management Page).

To change the operational mode of the IP SFP module in the Sx TAG, select the **SFP Mode** button. This displays the Setup: Firmware Mode window shown below:



The current SFP firmware mode is selected. To change mode, select the checkbox corresponding to the mode required. A prompt window is displayed asking for confirmation of the mode change request. Select **Yes** to confirm and wait approximately one minute to complete the change. Select **No** to cancel and remain in the current mode.

When the Mode switch has completed the Sx TAG will, by default, automatically switch to the **Video Flows** page. Wait until the Video Flows page has successfully loaded before accessing any menus.

This version of the PHABRIX IP SFP (**PHSFP-10SR-IP**) is shipped with four populated firmware slots, all of which are available for in-field upgrade and may be overwritten.

Note: Changing boot mode will cause the flow parameters to be reset to factory defaults. The parameters of the SFP management interface will persist across mode changes, that is, the management interface is not affected by any SFP mode changes.

SFP Mode Menu Structure

The menus presented to the user for each IP SFP boot mode are as follows:

2022-6 Encap	2022-6 Decap	2110 Encap	2110 Decap
SFP Setup:			
Video Flows:			
Audio Flows:			
N/A	N/A		
ANC Flows:			
N/A	N/A		
PTP:			
N/A	N/A		
Audio Map:			
N/A	N/A		
NMOS:			
NO	NO	YES	YES

SFP Setup (2110 and 2022-6)

Overview

The Sx TAG will display one of three SFP Setup pages, depending on the SFP Mode. The SFP Mode Selection together with Management Interface Status information and Setup are common to all three configurations. In the top-left side of each SFP Setup menu, the **SFP Mode** button allows selection of the operational mode of the SFP (see the section SFP Mode).

The 2110 Encap Management page has additional controls for the SFP Frame Synchronizer.

The 2110 Decap Management page has additional controls for the Clean Switch.

The IP SFP can be remotely controlled in-band over the multimode fibre using REST API with a suitable REST Client, or using the custom control available with Riedel MN SET configuration, monitoring and control software. MN SET is available to purchasers of PHABRIX SFPs from the PHABRIX website.

2022-6 SFP Setup Management Page (Encap/Decap)

The screenshot displays the SFP Setup Management Page for a 2022-6 SFP. The top status bar shows: In: Absent, NO AES, Out: 625i50, Lock: Free, Log, and a battery icon with the time 07:14. The main area is divided into several sections. On the left, a vertical label reads '2022-6 Decap'. The top-left section contains 'SFP Mode' and 'SFP Status: OK'. The top-right section, titled 'Management', includes a 'Setup' button, 'Hostname: emsfp-a0-68-b0', 'MAC 40:A3:6B:A0:68:B0', 'IP Address: 192.168.12.233', 'Subnet Mask: 255.255.255.0', 'Default Gateway: 192.168.12.3', 'Rx Packets: 0', 'Tx Packets: 5', 'DropPackets: 0', and a 'Counter Reset' button. The bottom-left section, 'Ethernet Packets', shows 'Rx: 0' and 'Tx: 0'. The bottom-right section, 'Management VLAN', shows 'VLAN ID Disabled' and 'PCP Disabled'. At the bottom, a navigation bar includes 'Main Menu', 'Video Flows', and 'SFP Setup'.

Each Management Page displays the following status information:

Hostname:

Host name of the SFP, the default is based on the MAC address. This can be re-named using Riedel MN SET control software.

MAC:

IP SFP Management MAC address

IP Address:

IP SFP management address (either static or dynamic using DHCP). This is the only address that the SFP will respond to an ARP or PING and may also be used as the source IP address for a Media Flow/Stream

Subnet Mask:

Subnet Mask

Default Gateway:

Gateway IP address

Rx Packets:

Counter showing the number of management packets received

Tx Packets:

Counter showing the number of management packets transmitted

DropPackets:

Counter showing the number of management packets dropped

Counter Reset:

Resets all Management and Ethernet packet counters

VLAN ID:

Management VLAN ID if enabled

PCP:

Management VLAN Priority Code Point if enabled

Ethernet Rx:

Counter showing the total number of received Ethernet Packets for all traffic including Video, Audio and ANC Flows/streams

Ethernet Tx:

Counter showing the total number of transmitted Ethernet Packets for all traffic including Video, Audio and ANC Flows/streams.

2110 Encap SFP Setup Management Page

In: 1080i50 NO AES Out: SDI In Loop Lock: / Inp-1 Log 19:37

SFP Mode SFP Status: OK

Frame Sync

☐ Enable

Mode VertHoriz

MicroSec Offset 0

Vertical Offset 0

Horizontal Offset 0

Ethernet Packets

Rx: 62443

Tx: 110182309

Management VLAN

VLAN ID Disabled

PCP Disabled

Management

Hostname SxTAG v3.7 Enc Setup

MAC 40:A3:6B:A0:80:C0

IP Address 192.168.10.23

Subnet Mask 255.255.255.0

Default Gateway 192.168.10.254

Rx Packets 40329

Tx Packets 16065

DropPackets 0

Counter Reset

2110 Encap

Main Menu Video Flows Audio Flows ANC Flows PTP Audio Map SFP Setup

Press **SFP Setup** to change the SFP configuration as described below.

Press **SFP Mode** to change the SFP operational mode as described in the previous section.

The **Frame Sync** section enables a Video Frame Synchronizer and the PCM Audio Sample Rate converters. This locks any asynchronous SDI input to PTP, and will increase the latency through the device. The phase of the Video with respect to PTP can be controlled using the **Vertical** and **Horizontal Offset** controls.

Note: The Frame Sync cannot be enabled if an Audio Flow is set to 2110-31. Conversely, an Audio Flow cannot be set to 2110-31 if the Frame Sync has already been enabled.

2110 Decap SFP Setup Management Page

In: 1080i50 NO AES Out: 1080i50 Lock: Free Log 03:58

SFP Mode SFP Status: OK

Clean Switch

Switch Mode ☐ Enable

Switch Now

IGMP Delay (ms) 300

Ethernet Packets

Rx: 1614428946

Tx: 6474856

Management VLAN

VLAN ID Disabled

PCP Disabled

Management

Hostname SxTAG v3.7 Dec

MAC 40:A3:6B:A0:80:B8

IP Address 192.168.10.11

Subnet Mask 255.255.255.0

Default Gateway 192.168.10.254

Rx Packets 16067204

Tx Packets 6466460

DropPackets 0

Counter Reset

Main Menu Video Audio ANC PTP Audio Map SFP Setup

Press **SFP Setup** to change the SFP configuration as described below.

The **Clean Switch** section provides smooth switching between IP sources for a stable viewing experience.

Press **SFP Mode** to change the SFP operational mode as described in the previous section.

Management Setup (2110 Encap / 2110 Decap)

In: 1080i50 NO AES Out: SDI In Loop Lock: / Inp1 Log 17:57

Setup: Management

SFP

Reboot

Power Cycle

Reset

Flows Configuration Reset

Application Configuration Reset

Entire Configuration Reset

Management VLAN

VLAN ID 0 PCP 0 ☐ Enable

IP Address 192 168 10 10

Subnet Mask 255 255 255 0

Default Gateway 192 168 10 254

DHCP On Off

DHCP Status: Off

Apply Cancel

Close Window

Press **Setup** to display the **Setup: Management** dialog box, which provides all the controls to configure the SFP management port, soft reboot or power-cycle the SFP and return the SFP to factory default settings. Changes made in the dialog box will only take effect by pressing **Apply**. To quit the dialog box without making changes, select either **Cancel** or **Close Window**.

The IP SFP Management IP address, Subnet Mask and Default Gateway may be entered either manually or configured automatically (dynamically) using the Dynamic Host Configuration Protocol (DHCP). The setup controls have the following functions:

DHCP:

Dynamic Host Configuration

ON:

Switch ON to have the network automatically assign IP Address, Subnet Mask, Default gateway to the SFP (in DHCP enabled networks with an in-band DHCP server). Note: When using NMOS with automatic discovery, you need to enable DHCP to allow the SFP to locate the DNS server.

OFF:

Switch OFF DHCP to set the management IP Address, Subnet Mask, Default gateway manually. Consult your network administrator for a suitable IP Address, Subnet Mask and Default Gateway.

If an IP address is set manually with DHCP set to OFF, then the address of the DNS server, domain name and NMOS registry must also be set manually using either the REST API or MN SET.

DNS:

Domain Name System

Protocols on the DNS Server are used to resolve internet domain names to IP addresses, enabling browsers to load internet resources. It is not possible to configure the IP address of the DNS server for the SFP manually from the Sx TAG itself. If DHCP is enabled and in use by the system and if DNS is being advertised, DHCP will locate the DNS server. If DHCP is not enabled, you will need to set the IP address of the DNS server for the SFP using MN SET, or a similar tool.

Management VLAN:

Virtual Local Area Network

Selecting the Management VLAN **Enable** checkbox will display the **VLAN ID** and **PCP** fields. Select an appropriate VLAN ID value from the range 0 to 4095. The VLAN Priority Code Point (PCP) range is from 1 to 7, default 0. The PCP classes are as follows:

PCP Value	Priority	Acronym	Traffic Types
1	0 (Lowest)	BK	Background
0	1 (Default)	BE	Best Effort
2	2	EE	Excellent Effort
3	3	CA	Critical Applications
4	4	VI	Video: > 100 ms Latency and Jitter
5	5	VO	Voice: > 10 ms Latency and Jitter
6	6	IC	Internetwork Control
7	7 (Highest)	NC	Network Control

Reset:

[2110 Only] Choose to reset specific elements of the configuration back to the factory settings as follows:

Flows Configuration:

Resets the flow IP addresses

Application Configuration:

Resets the flow IP addresses and audio mapping settings

Entire Configuration:

Resets the flow IP addresses, audio mapping settings and the PTP settings.

SFP Reboot:

Software reboot of the IP SFP.

SFP Power Cycle:

Hardware reboot (power down and power up) of the IP SFP.

Frame Sync (2110 Encap only)

When enabled, the Frame Synchronizer ensures that video and audio media flows will be synchronized to PTP, allowing for free-running SDI sources, or genlocked sources that are unaware of PTP timing, to be converted to PTP locked 2110 media flows. Video synchronization is achieved by frame drop or repeat, and audio synchronization is achieved using sample rate conversion. The Frame Synchronizer will introduce additional latency, and any coded audio such as Dolby E will be rendered unusable by the audio sample rate converters.

Note: The synchronizer does not provide an audio tracking delay so the video to audio relative timing will vary by up to one frame.

Note: The ANC is not synchronized.

Any test patterns generated by the Sx TAG, or SDI source being converted from SDI to 2110, will only be locked to PTP if:

- The IP SFP frame synchronizer is enabled, or

Note: The Frame Sync cannot be enabled if an Audio Flow is set to 2110-31. Conversely, an Audio Flow cannot be set to 2110-31 if the Frame Sync has already been enabled.

- The Sx TAG is being used as a generator and is locked to an SDI source or External reference that is locked to PTP, or
- The SDI source that is being converted from SDI-to-2110 is locked to PTP.

To use the Frame Synchronizer, select the **Enable** checkbox.

Mode VertHoriz:

Enter the required video phase in Video Lines (**Vertical Offset**) and Pixels (**Horizontal Offset**). The number of microseconds is calculated automatically and displayed.

You can then control the Video Timing phase with respect to PTP. This can be used to move the video timing which will then change the value of ST 2110-21 TR_{OFFSET} and bring this into its nominal position.

Mode MicroSec:

Enter the required video phase offset in microseconds (μs).

Clean Switch (2110 Decap only)

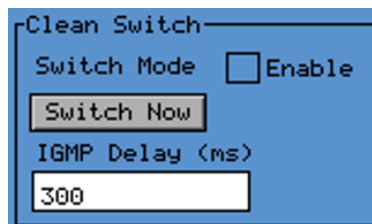
The 2110 Decap mode supports a total of 12 media streams simultaneously, as follows:

- One Video 2110-20/2022-7 pair
- Four PCM Audio 2110-30/2022-7 pairs
- One ANC 2110-40/2022-7 pair

When switching between sources, if these are each selected individually, in turn, a situation will arise with a mixture of video, audio and ANC flows from the two sources until every media stream has been re-selected.

When enabled, the **Clean Switch** dialog allows the IP addresses of the next source to be entered so that these will be executed as a single command when **Switch Now** is selected. This is analogous to an SDI router salvo.

In addition, the Clean Switch is a make-before-break switch. The SFP will continue to decap the current set of flows, while issuing the IGMP request for the next set of media flows. The switch will then be delivering two complete sets of flows to the SFP.



The **IGMP Delay** is the hold-off time, in milliseconds, after issuing the IGMP requests for the next set of flows before the IP SFP switches from the current flow to the next flow. The minimum value of this hold off time will be dependent on the network topology.

IGMP Delay:

300 ms (Default)

PTP (2110 Only)

The PHABRIX IP SFP supports the SMPTE standard ST 2059, a profile of IEEE Std 1588-2008 Precision Time Protocol (PTP). This can be thought of as the equivalent in IP systems for analog Black and Burst or Tri-syncs. PTP systems send timestamp information between a PTP Leader and a PTP Follower, such as the PHABRIX IP SFP in the Sx TAG. The PTP Follower then reconstructs the PTP clock and time of the PTP Leader from these timestamps. The SFP accepts in-band PTP traffic over the multimode fiber; no external connection is required.

The following PTP communication modes are supported:

- Multicast one-step
- Multicast two-step
- Mixed (Hybrid) one-step
- Mixed (Hybrid) two-step

The supported combination of multicast and unicast for each communication mode is as follows:

Communication Mode	Announce	Sync	Delay Request	Delay Response
Multicast	Multicast	Multicast	Multicast	Multicast
Mixed (Hybrid)	Multicast	Multicast	Unicast	Unicast

In: 1080i50 NO AES Out: SDI In Loop Lock: ✓ Inp-1 Log 17:01

PTP Status

Setup Reset

PTP Mode Multicast

PTP Leader Source 1

PTP Status Fine Lock

Source 1

Source 2

Syncs 65535 0

Follow Ups 65535 0

Delay Requests 65535 0

Delay Responses 65535 0

Drop Follow Sync 0 0

Drop Delay Response 0 0

PTP Source 1

Version 2

Presence 1 Domain 0

VLAN 0 QoS 46

GM ID 00.09.0D.FE.FE.00.FE.BA

GM IP 192.168.10.254

DRq IP 224.0.1.129

PTP Source 2

Version 0

Presence 0 Domain 2

VLAN 0 QoS 46

GM ID D8.80.39.FF.FE.91.1A.23

GM IP 0.0.0.0

DRq IP 0.0.0.0

2110 Encap

Main Menu Video Audio ANC PTP Audio Map SFP Setup

Flows Flows Flows

PTP Status Dialog

The **PTP Status** section provides the following information:

PTP Mode:

PTP Communication Mode, Multicast, Mixed (Hybrid) without negotiation, Unicast.

PTP Leader:

Defines which of the two PTP sources acts as the source clock.

PTP Status:

Indicates the status of the SFP PTP lock. Coarse lock is frequency locked, fine lock is frequency and phase locked.

The PTP Source sections 1 and 2 provide the following information for each of the two possible PTP sources:

Version:

PTP version, this should be version 2 for SMPTE ST 2059 profile.

Presence:

If one (1) then PTP Leader Announce messages are detected on the selected domain number.

Domain:

PTP Domain number, 0 – 127.

VLAN:

PTP VLAN Tag.

QoS:

Value of the quality of service in the Differentiated Services Code Point in the IP packet header of messages from the PTP Leader.

GM ID:

MAC address of the Grandmaster clock.

GM IP:

IP address of the PTP Leader. This may be the IP address of the Grandmaster clock or the IP address of a PTP boundary clock.

DRq IP:

The IP address to which delay request messages are being sent by the IP SFP. The IP Address 224.0.1.129 is defined by the IANA as the PTP-primary.

Counters Status Dialog

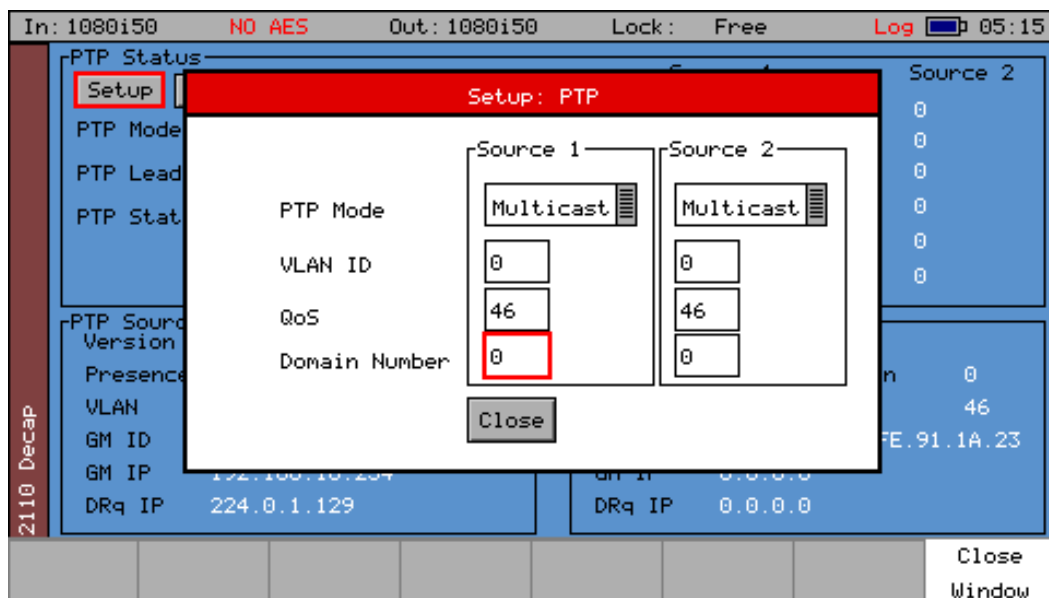
The Counters dialog displays the current status of various counters, for example, showing the number of Sync, Follow ups (two step, Delay Requests and Responses, etc.)

Counter Reset:

Reset the PTP counters.

PTP Setup Dialog:

Select the **Setup** button to open the following **Setup: PTP** dialog box, containing setup fields for the two announce detectors:



The two separate PTP Mode controls for Source 1 and Source 2 are ganged together so that if you update one, the corresponding control is also automatically updated.

PTP Mode:

Select the required PTP Communication mode: Multicast, Mixed, Unicast.

VLAN ID:

Enter the VLAN ID number for the PTP VLAN. Default value is 0 indicating that VLAN is not being used.

QoS:

Enter the value of the Quality of Service in the Differentiated Services Code Point in the IP packet header of the outgoing Delay Request messages.

Domain Number:

PTP Domain number in the range specified by ST 2059, 0 to 127. Multiple PTP domains can co-exist simultaneously.

NMOS (2110 Only)

The PHABRIX IP SFP 2110 v3.7 supports the NMOS registry mode as follows:

- IS-04 Discovery and Registration v1.2
- IS-05 Device Connection Management v1.0
- IS-08 Audio Channel Mapping v1.0.1

The registry is discovered using multicast DNS-SD or mDNS and this is configured using either the REST API or the MN SET configuration utility. This allows an Sx TAG to discover and connect to an NMOS registry automatically, advertise which version of the NMOS APIs are supported, and then make available and receive Session Description Protocol (SDP) records.

Note: Make sure that DHCP is also enabled for the SFP if automatic discovery and registration is required.

An NMOS browser or NMOS-enabled control system can then make a connection between an NMOS sender and an NMOS receiver. This can be as simple as dragging and dropping a flow from a sender to a receiver node without the need to enter any IP addresses or format information. This action will cause the receiving device to access the sender SDP transport file for that flow or 2022-7 primary and secondary flow pair. On receipt of an SDP transport file, the SFP will make an IGMP join, automatically

configure the receiver video, audio and ANC formats according to the information in the SDP transport file, and then respond to the registry that a connection has been made.

There are no Sx TAG user controls for this functionality. The URL to an SDP transport file can be found using either MN SET, an NMOS browser or NMOS controller.

SDP transport files are automatically generated by the Encapsulator from the Video, Audio and ANC configuration set-up and the primary and secondary Flow IP addresses. No user intervention is required.

Note: In this version of emSFP 2110 Decap (3.7.4015), the 2110-30 and 2110-31 flow type must be configured manually as the 2110-30/-31 flow type is not automatically configured by the NMOS join and the transfer of the SDP file. The Audio packet time and number of channels are configured by the NMOS join.

Link Layer Discovery Protocol (LLDP)

LLDP is a link layer protocol used by network devices to advertise their identity, capabilities and neighbors. This tool is a useful in-band method to identify the port and device to which the Sx TAG is connected at the other end of a wired Ethernet link on a local area network.

LLDP is enabled by default in the IP SFP and the SFP will search for neighboring LLDP-enabled devices to which it is connected over the multimode fiber.

The IP SFP reports the remote device over MN SET (this information is not available on the Sx TAG):

- LLDP Frame Rate
- Chassis MAC address
- Port Number
- Time to Live (TTL)

The IP SFP advertises the following LLDP information:

Chassis ID:

SFP IP Management MAC Address

Port ID & Subtype:

SFP IP Management IP Address

System Name:

SFP IP Hostname

System Description:

In-band firmware description and software version number. Note: This is not the same name as is reported in the SFP Boot mode dialog box

Management Address:

SFP IP Management IP Address.

Media Flow IP Status

The IP SFP supports the generation and reception of either single (primary) or primary-secondary flows for ST 2022-7 operation. Flow connections can be either by multicast or unicast.

Status information is provided for both primary and secondary media flows and is common to all media flow types for both encap and decap. The 2110 Decap Video Flows screen is shown below as an example.

The screenshot displays the '2110 Decap' screen with a blue background. At the top, status indicators include 'In: Absent', 'NO AES', 'Out: 625i50', 'Lock: Free', and a 'Log' button. The main area is divided into two sections: 'Primary Flow' and 'Secondary Flow'. Each section has a 'Setup' button (highlighted with a red box in the Primary section) and a 'Flow' checkbox. The Primary Flow configuration shows: Src IP 192.168.0.1, Dest IP 239.0.1.2, Dest MAC 01:00:5E:00:01:02, RTP PT 96, VLAN 0, Port 10000, Port 20000, and SSRC 0. The Secondary Flow configuration shows: Src IP 192.168.0.1, Dest IP 239.0.1.3, Dest MAC 01:00:5E:00:01:03, RTP PT 96, VLAN 0, Port 10000, Port 20000, and SSRC 0. To the right of each flow section is a 'Video' configuration box with 'SDI HD Std: 50i', 'Sampling: 422 YCbCr', 'SMPTE274 1920x1080', and 'Sender Narrow'. A 'Reset' button is located between the two flow sections. At the bottom, there is a 'Main Menu' button and a row of tabs: 'Video Flows', 'Audio Flows', 'ANC Flows', 'PTP', 'Audio Map', and 'SFP Setup'. The 'Video Flows' tab is currently selected.

Configuration information specific to a Media flow type and encapsulation or decapsulation is described in the following Encap and Decap sections.

The Flow IP Status information is provided for all flows as follows:

Flow Enable:

When this checkbox is selected the IP SFP will either be transmitting (Encap) or actively receiving and processing a flow (Decap).

SRC IP:

Flow source IP address.

SRC Port:

Flow source port number.

Dest IP:

Destination IP address of the flow. For a Multicast Flow, this address should be within the range: **224.0.0.0** to **239.255.255.255**. For a Unicast Flow, then this is the destination IP address.

Dest Port:

Destination port number.

Dest MAC:

The Destination MAC address, automatically derived from the destination IP address.

VLAN:

The Flow VLAN ID Tag. A value of zero indicates that VLAN is not used.

SSRC:

The flow synchronization source identifier.

Note: SSRC is not provided for 2022-6 Encap Secondary video flows. For 2022-6 Decap, SSRC status is updated only when the flow is first enabled and is not dynamically updated.

Note: The SSRC Byte order is reversed on the API for both 2022-6 Encap and Decap. The Sx TAG GUI displays the correct SSRC, however, the byte order of the SSRC is reversed in the REST API and will appear to be reversed in other emSFPs.

TX/RX Packet:

Counters showing the number of transmitted (Tx Encap) or received (Rx Decap) flow packets for the primary and secondary flows.

Seq Errors:

[Decap Only] this counter shows the number of detected packet sequence errors for the primary and secondary flows.

Reset:

[2110 Decap/Encap] Resets both the primary and secondary flow Packet counters and, in addition, resets the Seq Error counter in Decap mode.

[2022-6 Decap/Encap] Separate reset buttons for Primary and Secondary flows. Resets either the primary or secondary flow Packet counters and, in addition, resets the DGRAM Rate counter in Decap mode.

Note: When resetting the packet and error counts in 2022-6 Encap/Decap modes, make sure to stop and restart the flow to restart the counter from zero.

RTP PT:

RTP Payload Type - numeric code to identify the payload type. In SMPTE ST 2022-6 this must have a value of 98. In SMPTE ST 2110 systems this will typically lie in the IANA dynamic range 96 - 127

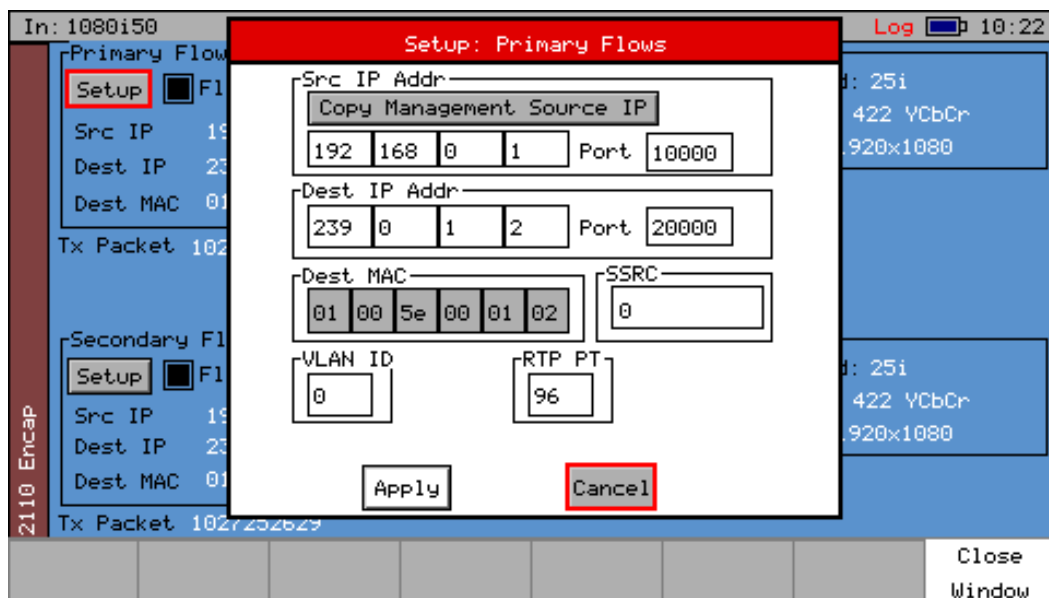
Filters:

[Decap only] If enabled the decap will only process a flow for which there is a parameter match. For example, if the Destination IP checkbox is selected, only a match in the destination multicast address between the flow and the configuration of the IP SFP is required to start processing a flow.

Media Flow IP Setup

Most elements of the Flow setup dialog box are common to all media flow types for both 2110 Encap and 2110 Decap; any minor differences are identified below.

Select the **Setup** button for either the primary or secondary flow to display the corresponding **Setup: Primary Flows** or **Setup: Secondary Flows** dialog.



Multicast Setup:

For Multicast Transmission the required settings depend on the parameters used by destination devices to filter the flow. The minimum required is the destination IP address, all other parameters are optional.

Src IP:

Enter the required source IP address.

Note: The management IP address is the only address on which the SFP will respond to an ARP request. If you wish to ping or ARP the flow source address, then set the Encap Source IP address to be the same as this management address.
 [Encap Only] Use the **Copy Management Source IP** button to copy the management source IP address to the source IP address.

Src Port:

Required source port number.

Dest IP:

Enter the Multicast Destination IP address. For Multicast operation this needs to be within the range **224.0.0.0** to **239.255.255.255**

Dest Port:

Required destination port number.

Dest MAC:

In multicast, if the destination IP address is within the multicast range then the destination MAC address cannot be edited but is calculated automatically by the Sx TAG.

SSRC:

The flow synchronization source identifier. Note: Grayed-out in 2110 Decap Mode.

VLAN:

The Flow VLAN ID Tag. A value of zero indicates that VLAN is not used.

RTP TP:

Set RTP Payload Type in the range 96 - 127 (2110 Encap only). Set the number using either the ± 10 or ± 100 buttons, or the Up/Down cursor keys to increment or decrement the number.

Select **Apply** to implement your changes or **Cancel**.

Unicast Setup:

For Unicast Transmission the required settings depend on the parameters used by destination devices to filter the flow. The minimum required depends on how you are connecting, either:

- Connecting directly to the target device, or
- Connecting through a Switch with or without IP routing, using a VLAN, or
- Connecting through a Router.

Typically, the destination MAC address and IP address will be required, with other parameters being optional as follows:

Src IP:

Enter the required source IP address.

Note: The management IP address is the only address on which the SFP will respond to an ARP request. If you wish to ping or ARP the flow source address, then the Encap Source IP address to be the same as this management address.
[Encap Only] Use the Copy Management Source IP button to copy the management source IP address to the source IP address

Src Port:

Enter the required source port number

Dest IP:

Enter the IP address of the destination device

Dest MAC:

Enter the MAC address of the next device at the end of the link.

Direct connection without a switch:

Set to the MAC address of the target device.

Indirect connection via switch or a router:

This will vary depending on switch or router type and configuration.

Dest Port:

Required destination port number

Encap Video Flows (2110 and 2022-6):

The screenshot displays the '2022-6 Encap' configuration window. At the top, status information includes 'In: 1080i50', 'NO AES', 'Out: SDI In Loop', 'Lock: /', 'Inp-1', 'Log', and a battery icon with the time '14:09'. The interface is divided into two main sections: 'Primary Flow' and 'Secondary Flow'. Each section has a 'Setup' button (highlighted with a red box in the Primary Flow) and a 'Flow' checkbox. The Primary Flow settings are: Src IP 192.168.0.1, Dest IP 239.0.1.2, Dest MAC 01:00:5E:00:01:02, VLAN 0, Port 10000, and SSRC 0. The Secondary Flow settings are: Src IP 192.168.10.23, Dest IP 239.0.1.4, Dest MAC 01:00:5E:00:01:04, VLAN 0, Port 10000, and SSRC 0. Both flows show a 'Tx Packet' value (27098179 for Primary, 26099595 for Secondary) and a 'Reset' button. To the right of each flow section is a 'Video' section displaying 'SDI HD Std: 25i', 'Sampling: 422 YCbCr', and 'SMPTE274 1920x1080'. At the bottom, there is a navigation bar with 'Main Menu', 'Video', 'Flows', and 'SFP Setup'.

Select the **Flow** enable checkbox to enable the flow (start transmitting). This checkbox must be selected to transmit.

Note: SSRC is provided only for the Primary video flow in 2022-6 as this controls the SSRC in both primary and secondary 2022-6 flows.

Both primary and secondary SSRCs are displayed in 2110 as this mode has independent controls.

The **Video** section of the dialog displays the status of the video format currently being processed by the SFP. This is auto-detected from the SDI SMPTE ST 352 information being fed to the IP SFP. If the video format is not supported, the Video Config field values will display in red.

The additional parameters in the **Video** section are determined automatically from the input to the SFP as follows:

SDI:

SDI type, SD, HD, 3G

Std:

Frame rate of current video standard and image scan (progressive or interlaced)

Sampling:

Sampling Luma/Chroma Sampling ratio, Color format and Video spatial format eg: 1920x1080

Sender Type:

[2110 Decap Only] Select the required sender type from: Narrow, Narrow Linear, or Wide.

Note: The 2110 Encap Sender Type is always Narrow and there is no control for this.

Encap

2110 Encap Audio Flows (2110 only)

The IP SFP supports the encapsulation of up to eight ST 2110-30 PCM or 2110-31 AES3 audio flows with up to 16 channels of audio sampled at 48 kHz per flow. The maximum number of audio channels per flow is governed by the selected audio packet time. The SFP supports the following audio packet times and maximum number of audio channels:

Audio Packet Time	Maximum Number of Audio Channels (2110-30)	Maximum Number of Audio Channels (2110-31)
1 ms	10	6
125 µs	16	16
250 µs	16	16
333 µs	16	16
500 µs	16	14

Note: The maximum number of audio channels is a function of the selected audio packet time and the choice of 2110-30 or 2110-31.

Press the **Audio Flows** softkey to display the Audio Flows configuration dialog.

In: 1080i50 NO AES Out: SDI In Loop Lock: ✓ Inp-1 Log 15:05

Primary Flow

☒ Setup ☐ Flow

RTP PT 97

VLAN 0

Src IP 192.168.0.1 Port 10000

Dest IP 239.0.1.6 Port 20000

Dest MAC 01:00:5E:00:01:06 SSRC 456789123

Tx Packet 1213884

Reset

Secondary Flow

☒ Setup ☐ Flow

RTP PT 97

VLAN 0

Src IP 192.168.0.1 Port 10000

Dest IP 239.0.1.7 Port 20000

Dest MAC 01:00:5E:00:01:07 SSRC 456789123

Tx Packet 1219481

Audio

Packet Time 125 us

Sampling 48000

Channels 16 Type 2110-31

2110 Encap

Main Menu Video Audio ANC PTP Audio Map SFP Setup

Flows Flows Flows

Select the **Flow** enable checkbox to enable the flow (start transmitting). This checkbox must be selected to transmit.

Flow number:

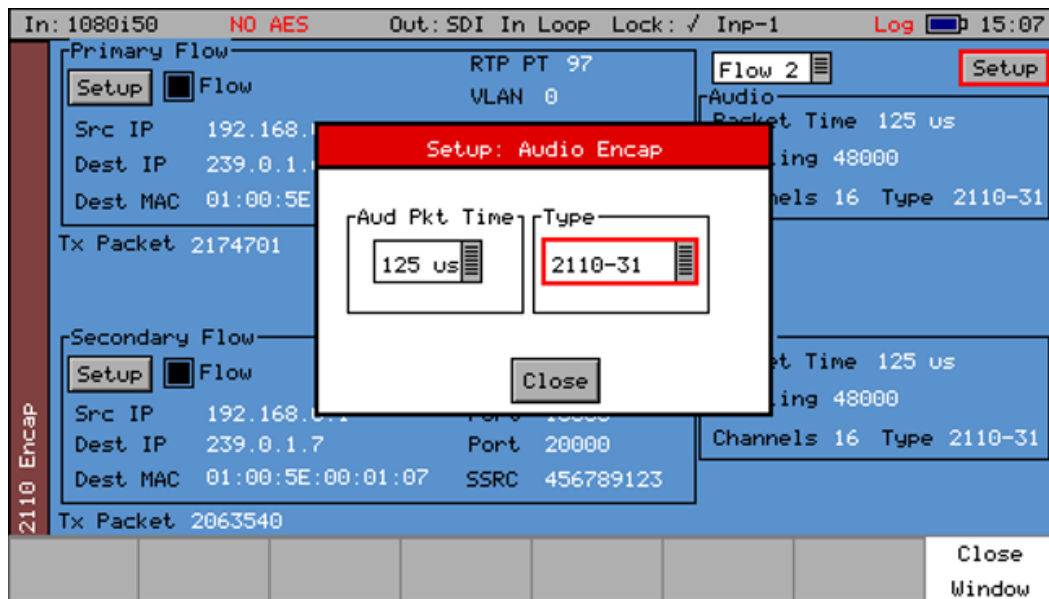
Select which of the eight audio flows are to be monitored or configured from the drop-down list.

Flow enable:

Select this checkbox to enable the flow (start transmitting) of the selected flow number, it must be selected in order to transmit.

The **Audio** section of the dialog displays the status of the audio currently being processed by the SFP. This is manually entered using the information provided in the **Setup: Audio Encap** dialog as described below.

Select the **Setup** button in the top right-hand corner to display the **Setup: Audio Encap** dialog box. This enables configuration of both the primary and secondary flows.



The Audio Encap setup parameters are as follows:

Aud Pkt Time:

Select the required audio packet time, depending on the required latency and the number of audio channels.

Type:

Select either SMPTE ST 2110-30 PCM or ST 2110-31 AES3.

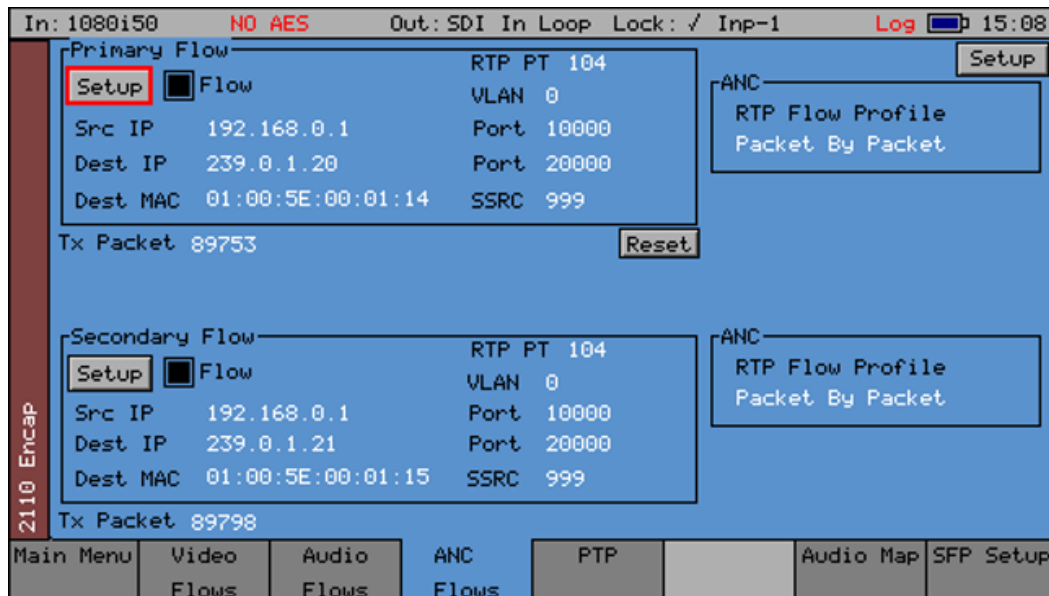
If the number of enabled channels exceeds the maximum number for that audio packet time, then the audio packet time and number of channels in the **Audio** section of the **Audio Flows** page will change color from white to red. The required Flow type and associated Audio Packet time should be configured before configuring the Audio Map, as an invalid Audio Map will be rejected by the SFP and will have to be re-entered once the correct Flow type and packet time have been selected.

Note: The number of enabled channels is automatically calculated from the Audio Map table.

Note: The maximum number of channels available to the Encap Audio Map is determined by the choice of Encap Audio Flow type and Audio Packet time.

Note: ST 2110-31 transport of AES3 requires audio pairs.

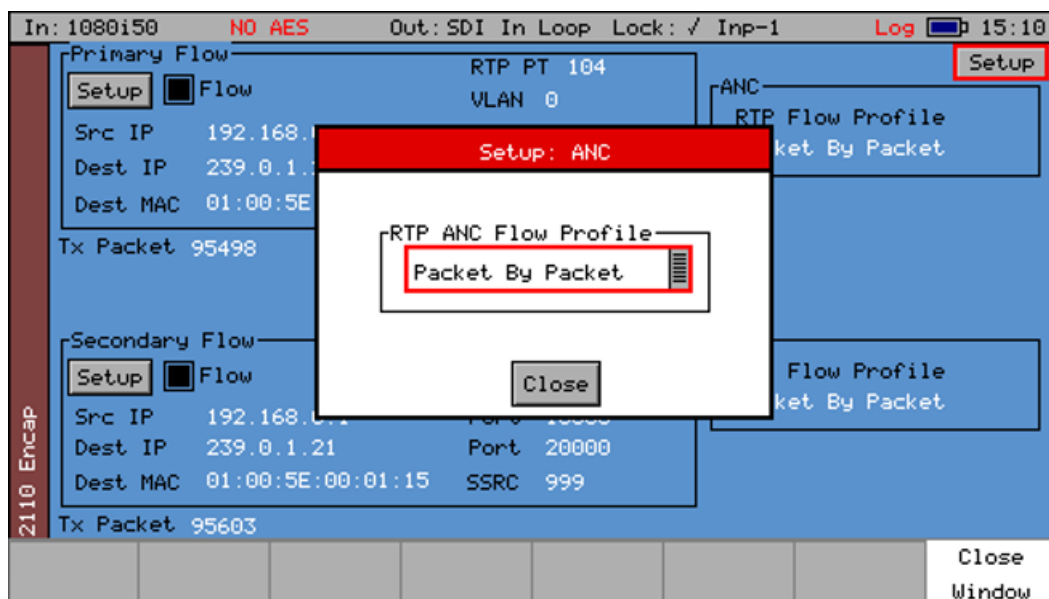
2110 Encap Ancillary (ANC) Flows (2110 only)



Select the **Flow** enable checkbox to enable the flow (start transmitting). This checkbox must be selected to transmit.

The ANC section of the dialog displays the status of the RTP ANC flow profile. This changes the way in which the encapsulator schedules the transmission of ANC packets.

Select the **Setup** button in the top right-hand corner to display the **Setup: ANC** dialog to configure both the primary and secondary flows as follows:



The ANC Setup parameter has the following options:

RTP ANC Flow Profile:

End of Frame, 1 ms Timeout, Packet by packet

2110 Encap Audio Mapping Configuration (2110 only)

The **Audio Map** displays the status of a 16 x 128 audio matrix used to map the 16 channels of audio from the SDI source to the 16 channels of each of the eight audio flows, enabling audio shuffle. This matrix allows any audio channel in the SDI source to be mapped to any audio channel in any of the

eight output flows, providing a one-to-one enabling of an SDI audio channel into a 2110-30 flow, while retaining the channel order.

Note: The 2110-31 audio map requires that you correctly configure the routing of audio pairs.

The Audio Map status provides a quick overview showing which audio channels are enabled in each flow and which flows are active.

Note: If an invalid number of channels for a flow is selected, it will be rejected by the SFP until a valid Flow type and Audio packet time is set-up, and the mapping re-entered. The Encap Flow type and Audio Packet time should be set-up before configuring the Encap Audio map.

In: 1080i50 NO AES Out: SDI In Loop Lock: ✓ Inp-1 Log 17:03									
2110 Encap	Setup	Flow 1	Flow 2	Flow 3	Flow 4	Flow 5	Flow 6	Flow 7	Flow 8
	Chan 1	G1P1-L	G1P1-L	G1P1-L	G1P1-L	G1P1-L	G1P1-L	G1P1-L	G1P1-L
	Chan 2	G1P1-R	G1P1-R	-	G1P1-R	G1P1-R	G1P1-R	G1P1-R	-
	Chan 3	G3P1-L	G1P2-L	-	-	-	-	-	-
	Chan 4	G3P1-R	G1P2-R	-	-	-	-	-	-
	Chan 5	G3P2-L	G2P1-L	-	-	-	-	-	-
	Chan 6	G3P2-R	G2P1-R	-	-	-	-	-	-
	Chan 7	G4P1-L	G2P2-L	-	-	-	-	-	-
	Chan 8	G4P1-R	G2P2-R	-	-	-	-	-	-
	Chan 9	-	G3P1-L	-	-	-	-	-	-
	Chan 10	-	G3P1-R	-	-	-	-	-	-
	Chan 11	-	G3P2-L	-	-	-	-	-	-
	Chan 12	-	G3P2-R	-	-	-	-	-	-
	Chan 13	-	G4P1-L	-	-	-	-	-	-
	Chan 14	-	G4P1-R	-	-	-	-	-	-
	Chan 15	-	G4P2-L	-	-	-	-	-	-
	Chan 16	-	G4P2-R	-	-	-	-	-	-
Main Menu		Video	Audio	ANC	PTP		Audio Map	SFP Setup	
		Flows	Flows	Flows					

The enabled SDI audio channel numbers are indicated in each flow, with the default being the first stereo 2.0 pair from SDI Group 1 pair 1 (G1P1). Disabled channels are shown as a dash (-).

Active flows are highlighted in white, and inactive flows are grayed-out.

Select the **Setup** button to display the **Setup: Encap Mapping** dialog box.

In: 1080i50 NO AES Out: SDI In Loop Lock: ✓ Inp-1 Log 13:27

Setup: Encap Mapping

Flow 1

Ch 1

Ch 2

Ch 3

Ch 4

Ch 5

Ch 6

Ch 7

Ch 8

Active

Active

Active

Active

Active

Active

Active

Active

G1P1-L

G1P1-R

G3P1-L

G3P1-R

G3P2-L

G3P2-R

G4P1-L

G4P1-R

Ch 9

Ch 11

Ch 12

Ch 13

Ch 14

Ch 15

Ch 16

Active

Active

Active

Active

Active

Active

Active

G1P1-L

G1P2-L

G1P2-R

G2P1-L

G2P1-R

G2P2-L

G2P2-R

G1P1-L

G1P1-L

G1P1-L

G1P1-L

G1P1-L

G1P1-L

Close

2110

Chan 16

-

G4P2-R

-

-

-

-

-

First

Page Up

Page Down

Last

Default

Cancel

If the number of enabled audio channels exceeds the maximum available for the audio packet time set in the Audio Flows tab, this will result in a corrupted audio flow. The SFP supports the following audio packet times and maximum number of audio channels:

Audio Packet Time	Maximum Number of Audio Channels (2110-30)	Maximum Number of Audio Channels (2110-31)
1 ms	10	6
125 μ s	16	16
250 μ s	16	16
333 μ s	16	16
500 μ s	16	14

If the number of enabled channels exceeds the maximum number for that audio packet time, then the audio packet time and number of channels in the Audio section of the Audio Flows page will change color from white to red.

Decap

2022-6 Decap Video Flows

The screenshot displays the configuration interface for the 2022-6 Decap. At the top, status indicators show 'In: Absent', 'NO AES', 'Out: 625i50', 'Lock: Free', and a 'Log' button. The interface is divided into two main sections: Primary Flow and Secondary Flow. Each section has a 'Setup' button (highlighted with a red box) and a 'Flow' checkbox. The Primary Flow settings include: Src IP 192.168.0.1, Dest IP 239.0.1.2, Dest MAC 01:00:5E:00:01:02, VLAN 0, Port 10000, and SSRC 456123999. The Secondary Flow settings include: Src IP 192.168.0.1, Dest IP 239.0.1.4, Dest MAC 01:00:5E:00:01:04, VLAN 0, Port 10000, and SSRC 456123999. Both flows show an Rx Packet count and a DGram Rate of 2158816, with a 'Reset' button. A 'Filters' section allows selection of Src (IP, Port) and Dest (IP, Port, MAC, VLAN). Video settings on the right specify SDI HD Std: 25i, Sampling: 422 YCbCr, and SMPTE274 1920x1080. The bottom menu includes Main Menu, Video, Flows, and SFP Setup.

Flow Enable:

Select this checkbox to enable the flow, it must be selected in order to start processing the incoming flow.

Video Format:

HD 720p, HD 1080i, HD 1080sf, HD 1080p, HD 2K, 3G-A 1080p, 3G-A-2K 1080p

For details on supported video formats, see [Supported SDI Video Formats](#).

The 2022-6 Decap can auto-detect the video format from the incoming stream so manual configuration of the video format is not required.

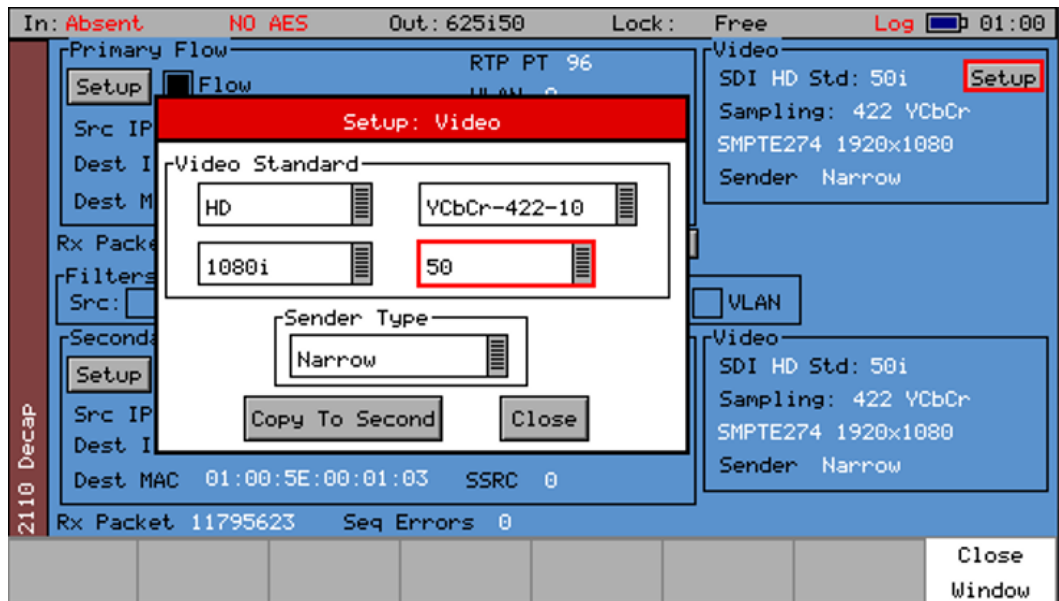
2110 Decap Video Flows

The screenshot displays the configuration interface for the 2110 Decap. At the top, status indicators show 'In: Absent', 'NO AES', 'Out: 625i50', 'Lock: Free', and a 'Log' button. The interface is divided into two main sections: Primary Flow and Secondary Flow. Each section has a 'Setup' button (highlighted with a red box) and a 'Flow' checkbox. The Primary Flow settings include: Src IP 192.168.0.1, Dest IP 239.0.1.2, Dest MAC 01:00:5E:00:01:02, VLAN 0, Port 10000, SSRC 0, and RTP PT 96. The Secondary Flow settings include: Src IP 192.168.0.1, Dest IP 239.0.1.3, Dest MAC 01:00:5E:00:01:03, VLAN 0, Port 10000, SSRC 0, and RTP PT 96. Both flows show an Rx Packet count and Seq Errors of 0, with a 'Reset' button. A 'Filters' section allows selection of Src (IP, Port) and Dest (IP, Port, MAC, VLAN). Video settings on the right specify SDI HD Std: 50i, Sampling: 422 YCbCr, SMPTE274 1920x1080, and Sender Narrow. The bottom menu includes Main Menu, Video, Audio, ANC, PTP, Audio Map, and SFP Setup.

Flow Enable:

Select this checkbox to enable the flow; it must be selected in order to start processing the incoming flow.

2110 Decap Video Flows - Video Setup



In 2110 systems it is difficult to auto-detect the video format and sender type. The video format and sender must either be configured manually or configured through the receipt of a Session Description Protocol (SDP) transport file under NMOS or Rest API control.

The IP SFP can accept flows from either Narrow (gapped), Narrow Linear, or Wide ST 2110 senders as defined in SMPTE ST 2110-21. A flow from a Wide sender will not be fully processed by a receiver/decapsulator with a buffer set to expect a Narrow sender. A receiver/decapsulator set to Wide can accept flows from either Wide or Narrow senders – but will have a larger buffer and associated processing latency and/or delay. The compatibility is as follows:

Sender	Narrow Receiver	Wide Receiver
Narrow	Yes	Yes
Wide	No	Yes

A Narrow Gapped flow will typically be generated from an SDI-to-2110 gateway, where the incoming SDI signal has been encapsulated with minimum processing delay and, as packets are only sent during active picture, there will be a gap in the stream of packets during the SDI vertical blanking. A Linear sender sends packets continuously, does not have a blanking period and may originate from a file-based server.

Note: Not all file-based servers are linear senders, many are set to be gapped senders as this means that any subsequent conversion from 2110 to SDI is simplified.

Select the **Setup** button in the Video section of the dialog to open the **Setup: Video** dialog box. Enter parameters to match the video format and sender type as follows:

Video Standard:

Bit Rate:

HD, 3G-A, 3G-A-2K

Sampling Format:

YCbCr-422-10

Video Format:

HD 720p, HD 1080i, HD 1080psf, HD 1080p, 3G-A 1080p, 3G-A-2K 1080p

Frame Rate:

23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60

Sender:

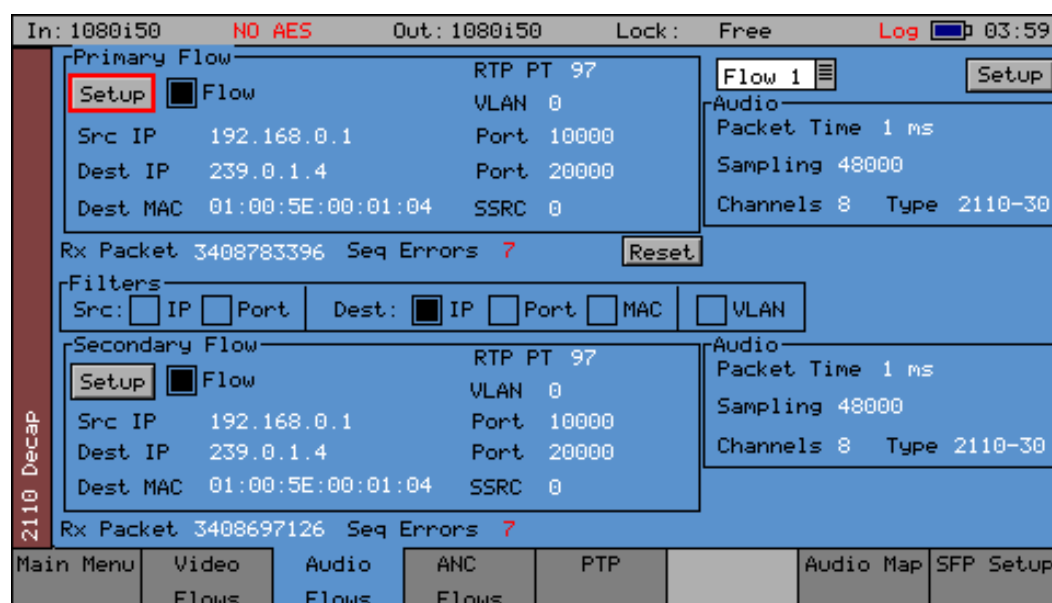
Narrow, Narrow Linear, Wide

For details on supported video formats, see [Supported SDI Video Formats](#).

2110 Decap Audio Flows

The IP SFP supports the decapsulation of up to four SMPTE ST 2110-30 PCM audio flows with up to 16 channels of audio per flow. The maximum number of audio channels per flow is governed by the audio packet time of the flow. The IP SFP supports the following audio packet times and maximum number of audio channels:

Audio Packet Time	Maximum Number of Audio Channels (2110-30)	Maximum Number of Audio Channels (2110-31)
1 ms	10	6
125 μ s	16	16
250 μ s	16	16
333 μ s	16	16
500 μ s	16	14



Flow Enable:

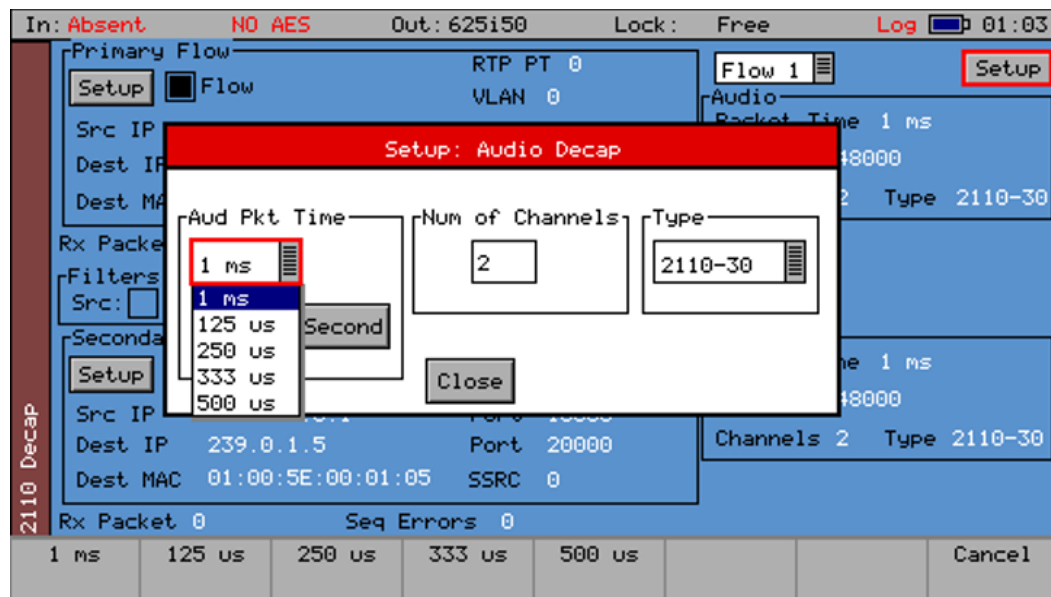
Select this checkbox to enable the flow, it must be selected in order to start processing the incoming flow.

Flow Number:

Select which of the four flows are to be monitored or configured.

The **Audio** section of the dialog displays the status of the audio currently being processed by the SFP. This is manually entered using the information provided in the **Setup: Audio Decap** dialog as described below.

Select the **Setup** button in the top right-hand corner to display the **Setup: Audio Decap** dialog box. This enables configuration of both the primary and secondary flows.



The Audio Decap setup parameters are as follows:

Aud Pkt Time:

Select the required audio packet time, depending on the required latency and the number of audio channels, from: 125 μ s, 250 μ s, 333 μ s, 500 μ s, 1 ms.

Num of Channels:

Select the number of audio channels within the selected flow, 1 - 16.

Type:

Select either SMPTE ST 2110-30 PCM or ST 2110-31 AES3 audio.

Note: 2110 Decap mode will not automatically adopt the 2110-30 or 2110-31 audio flow type as part of the NMOS join, so this must be manually configured.

If the number of enabled channels exceeds the maximum number for that audio packet time, then the audio packet time and number of channels in the Audio section of the Audio Flow page will change color from white to red.

Note: 2110-31 must have an even number of channels.

2110 Decap ANC Flows

In: 1080i50 NO AES Out: 1080i50 Lock: Free Log 04:00

Primary Flow

☒ Setup ☐ Flow

RTP PT 0

VLAN 0

Src IP 192.168.0.1 Port 10000

Dest IP 239.0.1.20 Port 20000

Dest MAC 01:00:5E:00:01:14 SSRC 0

Rx Packet 0 Seq Errors 0

Filters

Src: ☐ IP ☐ Port Dest: ☒ IP ☐ Port ☐ MAC ☐ VLAN

Secondary Flow

☒ Setup ☐ Flow

RTP PT 0

VLAN 0

Src IP 192.168.0.1 Port 10000

Dest IP 239.0.1.21 Port 20000

Dest MAC 01:00:5E:00:01:15 SSRC 0

Rx Packet 0 Seq Errors 0

2110 Decap

Main Menu Video Audio ANC PTP Audio Map SFP Setup

Flows Flows Flows

No configuration setup is required for the decap of an ANC flow, however, you still need to set-up the flow parameters.

2110 Decap Audio Mapping Configuration (2110 only)

The **Audio Map** displays the status of a 64 x 16 audio matrix that is used to map the 16 channels of audio from each of the four audio flows to the 16 audio channels of the SDI output. Full mono audio shuffle is available and as the audio flows are sent separately from the video providing full audio breakaway, so the audio can originate from any ST 2110-30 or ST 2110-31 source locked to the same PTP clock.

The Audio Map status provides a quick overview showing which audio channels are enabled in each flow and which flows are active.

In: 1080i50 NO AES Out: 1080i50 Lock: Free Log 04:03

☒ Setup

Audio Mapping

	Group 1				Group 2				Group 3				Group 4			
	1L	1R	2L	2R	1L	1R	2L	2R	1L	1R	2L	2R	1L	1R	2L	2R
Enable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Flow 1	01	02	-	-	-	-	-	-	03	04	05	06	07	08	-	-
Flow 2	-	-	03	04	05	06	07	08	-	-	-	-	-	-	-	-
Flow 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flow 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

2110 Decap

Main Menu Video Audio ANC PTP Audio Map SFP Setup

Flows Flows Flows

The mapped audio channel Index numbers for each flow are shown in their SDI audio Group and pair numbers, for example, G1P1 L, R. Disabled channels are shown as a dash (-).

Active flows are highlighted in white, and inactive flows are grayed-out.

Note: ST 2110-31 flows must be mapped as channel pairs.

Select the **Setup** button to display the **Setup: Decap Mapping** dialog box.

Audio Mapping 0-7			
G1P1	G1P2	G2P1	G2P2
Enabled <input checked="" type="checkbox"/>	Enabled <input type="checkbox"/>	Enabled <input type="checkbox"/>	Enabled <input type="checkbox"/>
Flow ID: 1	Flow ID: -	Flow ID: -	Flow ID: -
Channel Index: 1	Channel Index: 2	Channel Index: 1	Channel Index: 1

Audio Mapping 8-15			
G3P1	G3P2	G4P1	G4P2
Enabled <input type="checkbox"/>	Enabled <input type="checkbox"/>	Enabled <input type="checkbox"/>	Enabled <input type="checkbox"/>
Flow ID: -	Flow ID: -	Flow ID: -	Flow ID: -
Channel Index: 1	Channel Index: 1	Channel Index: 1	Channel Index: 1

The Decap Mapping parameters are as follows:

Enabled:

Select an Enabled checkbox to enable the required SDI channel (0 – 15). Note that in HD systems an entire audio group should be enabled to create a valid, embedded audio stream in an SDI signal

Flow ID:

Select which of the four flows (0 – 3) will be used to source the audio for the selected SDI channel.

Channel Index:

Select which of the 16 audio channels (0 – 15) within the selected Flow ID will be used as the audio source for the selected SDI channel.

Glossary of Terms

The following terms are used in the Sx Series user manuals:

2K-SDI

2K digital cinema can be transmitted via SDI as defined in the SMPTE ST 2048-2:2011 standard ("2048 x 1080 Digital Cinematography Production Image FS/709 Formatting for Serial Digital Interface") and SMPTE 428-9 (D-Cinema Distribution Master - Image Pixel Structure Level 3 - Serial Digital Interface Signal Formatting).

3G-SDI

A single 2.970 Gbit/s serial link (standardized in SMPTE 424M) that will replace the dual link HD-SDI (is standardized in SMPTE 372M).

AES

Audio Engineering Society

AES3-2003

Standard for digital audio — Digital input-output interfacing — Serial transmission format for two channel, linearly represented digital audio data.

Alignment Jitter

Artefacts above the specified threshold frequencies of (1 kHz for SD-SDI signals and 100 kHz for HD-SDI signals). Typically, video equipment cannot tolerate Alignment Jitter which cause decoding errors due to incorrect sampling of the data stream because the SDI Clock transition occurs on the edge of the data sample instead of in the center of the data sample.

CPU

Central Processor Unit

CRC

Cyclic redundancy check is an error-detecting code commonly used in digital networks and storage devices to detect accidental changes to raw data. Blocks of data entering these systems get a short check value attached, based on the remainder of a polynomial division of their contents; on retrieval the calculation is repeated, and corrective action can be taken against presumed data corruption if the check values do not match.

Decap

Decapsulation method of unpacking data according to associated protocols for receipt (Rx) from an IP network.

DID

Data ID is part of the Ancillary Data that is transmitted with the SDI data.

Dolby Digital

(AC-3) is a perceptual audio system for digital audio that allows the reduction of data needs to deliver high-quality sound. This system was developed primarily for DTV, DVD and HDTV.

Dolby Digital Plus

(E-AC-3) is a more advanced version of Dolby Digital that provides a more efficient encoding algorithm that provides enough bandwidth that allows up to 20 channels of audio (for a

primary program (Program 1) and optional ancillary programs that can be delivered at much lower bit rates than Dolby Digital.

Dolby E

An audio encoding and decoding technology developed by Dolby Laboratories that allows up to 8 channels of audio to be compressed into a digital stream that can be transferred between compatible devices and stored on a standard stereo pair of audio tracks.

DNS

Domain Name Service - a system for naming devices on a network or connected to the Internet.

DRq

Delay request message - one of the PTP event messages used to synchronize the PTP timestamp.

EDH

Error Detection and Handling protocol is an optional but commonly used addition to the Standard Definition-Serial Digital Interface (SDI) standard. This protocol allows an SD-SDI receiver to verify that each field of video is received correctly.

Encap

Encapsulation method of packing data according to associated protocols for transmission (Tx) on an IP network.

FPGA

A field-programmable gate array (FPGA) is an integrated circuit designed to be configured by the customer or designer after manufacturing.

Function Buttons

The set of eight buttons below the Instrument Display on the Sx and Rx Ranges that are used to select the Instrument Display menu options.

GM

Grandmaster clock - the PTP network clock to which all others synchronize.

GPI

General Purpose Input

Graticule

The scale displayed on an oscilloscope, vectorscope or waveform monitor that provides a visual indication of the signal amplitude, time base and phase relationship.

IGMP

Internet Group Multicast Protocol. Communications protocol used by hosts and adjacent routers on IPv4 networks to establish multicast group memberships for the transmission and processing of multicast traffic.

Input Status Bar

The bottom part of the Monitor Output display that shows the format and status of the input signals currently connected to the Rx chassis.

Instrument Display

The TFT monitor available on the Sx Range of products and on the Rx 2000.

IP Address

An Internet Protocol address is a numerical label assigned to devices connected to a computer network, using the Internet Protocol for communication.

LLDP

Link Layer Discovery Protocol - enables network devices to advertise their identity, capabilities, and neighbors on a local area network.

MN SET

Riedel software for discovery and control of Riedel IP products, for example SFPs.

MSA (SFP)

Multi-source agreement SFP is an industry agreed connection system for small form-factor pluggable (SFP) package fiber optic connection for a range of communication and video transport formats employing a Datacom Pinout.

Navigation Buttons

The up, down, left, right arrow buttons available on the Sx and Rx Ranges.

NMOS

Networked Media Oper Specification - specifications defined by the Advanced Media Workflow Association (AMWA) concerning networked media for professional applications.

Non-MSA (SFP)

An SD-SDI, HD-SDI and 3G-SDI small form-factor pluggable (SFP) package, for fiber video connection, which provides an SDI output employing a Video Pinout. SMPTE 297-2006 compatible.

PHABRIX SxA

A 3G-SDI, HD-SDI and SD-SDI handheld SDI test signal generator, analyzer and monitor supporting AES audio.

PHABRIX SxD

A 3G-SDI, HD-SDI and SD-SDI handheld SDI test signal generator, analyzer and monitor supporting dual link.

PHABRIX SxE

A 3G-SDI, HD-SDI and SD-SDI handheld SDI test signal generator, analyzer and monitor supporting eye and jitter measurement.

PSU

Power Supply Unit

PTP

Precision Time Protocol, IEEE Std 1588TM-2008 *IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems*.

QoS

Quality of Service - value in differentiated services codepoint in the IP packet header of messages from the PTP Grandmaster.

SDI

Serial Digital Interface - capable of transferring SD or HD broadcast video and broadcast audio between compatible devices.

SDI<->IP Gateway

This feature of the Sx TAG IP provides a convenient bridge between IP and SDI, bypassing the Generator. In Encap mode it routes the signal on the SDI I/O connector – which is configured as an SDI input, to the input of the IP SFP. In Decap mode the output of the IP SFP is routed to the SDI I/O connector – which is configured as an SDI output.

SDP

Session Description Protocol (RFC 4566) used in streaming media applications to describe communication sessions for the purposes of session announcement and session invitation.

SDP Transport File

Contains details of the media for Receiver and Sender participating in NMOS multimedia communication.

SFP

Small form-factor pluggable package typically providing fiber optic connection and employing an MSA Datacom Pinout or a Non-MSA Video Pinout.

Random Jitter

Refers to artefacts caused by random events or processes such as thermal or shot noise that cause small amplitude variations in the clock edge position or could cause large signal amplitude variations, though these typically would be infrequent.

Rasterizer

An electronic device used to display (either as picture or waveform) the video/audio data in a 3G-SDI, HD-SDI and SD-SDI stream. Typically, a Rasterizer will display multiple output forms of the same input data stream.

SDI

(Serial Digital Interface) capable of transferring SD or HD broadcast video and broadcast audio between compatible devices.

SMPTE

Society of Motion Picture & Television Engineers

SMPTE RP211

Implementation of 24P, 25P and 30P Segmented Frames for 1920 x 1080 Production Format

SMPTE 259M

Implement a SMPTE 259M Serial Digital Interface Using SMPTE HOTLink™ and CY7C9235/9335

SMPTE 260M

Television - 1125/60 High-Definition Production System - Digital Representation and Bit-Parallel Interface

SMPTE 274M

High Definition (HD) Image Formats for Television Production

SMPTE-276M

Television - Transmission of AES-EBU Digital Audio Signals Over Coaxial Cable

SMPTE 292M

Bit-Serial Digital Interface for High-Definition Television Systems

SMPTE 296M

1280 × 720 Scanning, Analog and Digital Representation and Analog Interface

SMPTE 297

Serial Digital Fiber Transmission System for SMPTE 259M, SMPTE 344M, SMPTE 292 and SMPTE 424M Signals

SMPTE 352

Payload Identification Codes for Serial Digital Interfaces —Amendment 1

SMPTE 424M

3 Gb/s Signal/Data Serial Interface

SMPTE 425-B

Mapping of 2 x SMPTE 292M HD SDI interfaces. Level-B can carry a Dual Link 1.485 Gb/s payload or two HD 1.485 Gb/s payloads.

SMPTE 425M-A

Direct mapping of source image formats

SMPTE 428-9

D-Cinema Distribution Master – Image Characteristics

TFT

(Thin Film Transistor) is a type of LCD (Liquid Crystal Display) monitor.

Timing Jitter

A short-term time interval error above a low frequency threshold of 10 Hz (as defined in the SMPTE standards for SDI signals).

UI

(Unit Interval) is time between consecutive clock cycles used to sample the SDI data stream. The UI measurement is used for Eye Pattern measurement.

Wander

A long-term time interval error, i.e., artifact below 10 Hz. Typically, all video equipment has the tendency to cause wander over a long period; these artifacts are not easily displayed in a meaningful way but are better logged as errors that exceed tolerances over a long period.

Specifications

Sx TAG Instrument

Operating Environment

Operating Temperature:

0° to 40°C

Operating Humidity:

< 85% RH (non-condensing)

If the unit is operated at a higher temperature, there is a possibility of a fire hazard.

If the temperature is changed rapidly from a cold environment to a hot environment, moisture can be created internally which can cause malfunction or damage the unit. Allow the unit to sit for 30 minutes without power applied to reduce any possibility of condensation.

If the temperature rises above 60°Celsius a warning dialog will be given. If the temperature rises above 65°Celsius the unit will be switched OFF.

Under both conditions, an event will be added to the event log to show what happened.

Expected Behavior

LCD Monitor

The LCD may have some pixels that are always turned ON or always turned OFF. This is normal and should not affect normal operation.

LCD Flicker

The unit supports many video standards. The input SDI signal is displayed asynchronously and may flicker on the waveform display or picture display. The unit stores the input SDI signal internally, and then reads the internal frame using the LCD sync signal, which is asynchronous to the input SDI signal. LCD flickering may occur if a frame is skipped or repeated.

Remote Network Operation

Remote network operation is only guaranteed when connected to a local machine.

Dimensions

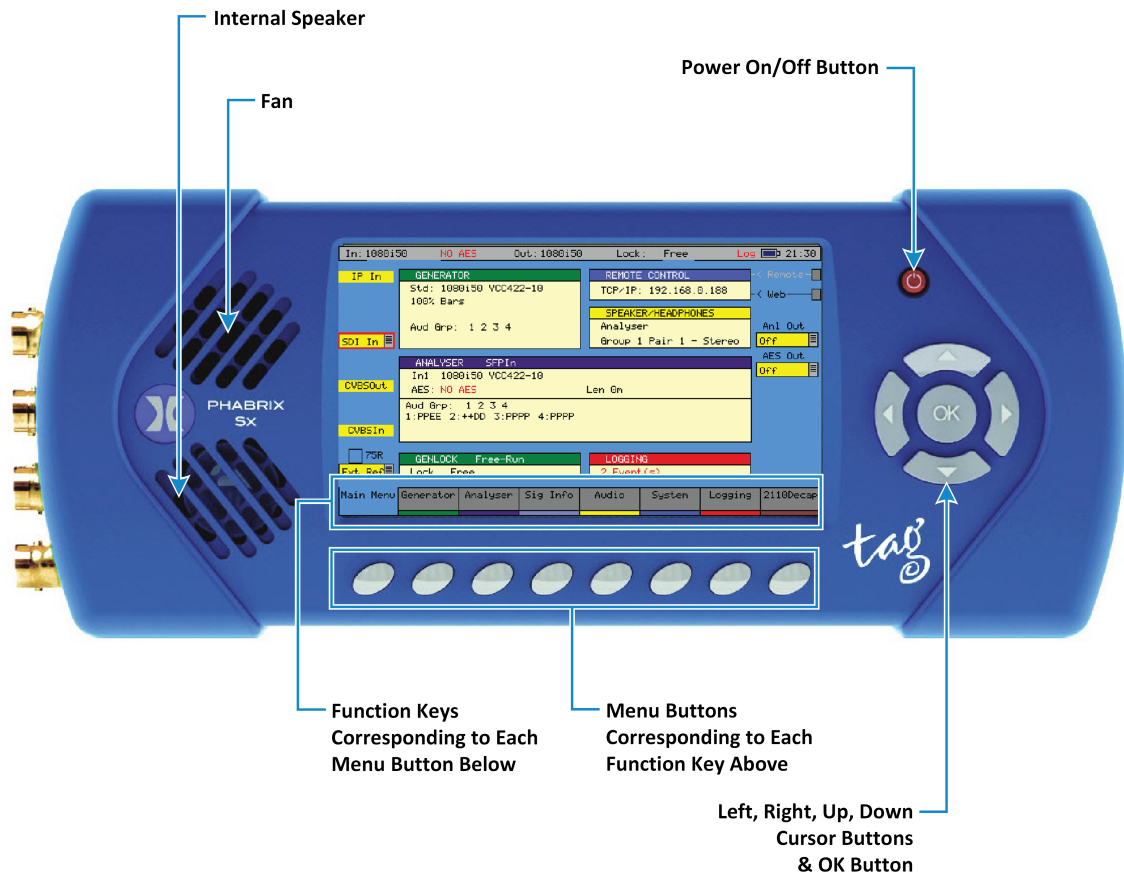
Dimensions:

230 (L) x 93(H) x 45(D) mm

Weight:

2 kg

Front Panel



The front panel provides access to the TFT Display and menu system.

Display Type:

4.3 inch TFT color

Display Format:

480 x 272 24 bits

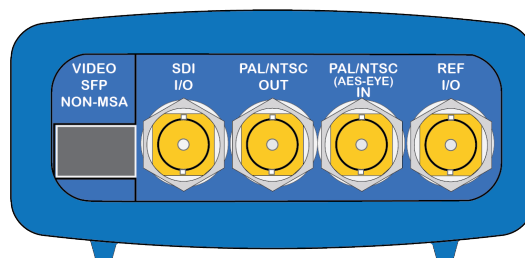
Backlight:

Variable brightness

Screen Saver:

Reduces brightness after user-adjustable time.

BNC Panel



The Sx TAG BNC panel provide the following connections.

SDI I/O

This connection is a bidirectional SDI interface. The Sx TAG can work as Analyzer or Generator but not both at the same time.

When working as an Analyzer this connector functions as follows:

Supported Standards:

SD-SDI or HD-SDI. See [Supported SDI Video Formats](#).

Connector:

BNC 75 ohm type

Input Impedance:

75 ohm terminated

Input Return Loss:

≥ 15 dB (5 MHz to serial clock frequency)

Maximum Input Voltage:

+/- 2 V

When working as a Generator this connector functions as follows:

Supported Standards:

SD-SDI or HD-SDI. See [Supported SDI Video Formats](#).

Connector:

BNC 75 ohm type

Output Impedance:

75 ohm terminated

Output Level:

+/- 400 mV

PAL/NTSC Out

Supported Standards:

PAL-I, PAL-M, PAL-N, NTSC

Connector:

BNC 75 ohm type

Output Impedance:

75 ohm terminated

Output Level:

1 V into 75 ohm

Frequency Response:

DC to 5.8 Mhz +/- 1%

Waveform Accuracy:

<1%

Vector Accuracy:

+/- 1°

PAL/NTSC (AES Eye) IN

Supported Standards:

PAL-I, PAL-M, PAL-N, NTSC

Connector:

BNC 75 ohm type

Input Impedance:

75 ohm terminated

Input Return Loss:

≥ 35 dB (100 Hz to 10 MHz)

Maximum Input Voltage:

+/- 2 V

REF I/O

The Ref I/O connection is bidirectional. When operating as a reference input it has the following characteristics:

Label:

REF I/O

Input Signal:

Tri-level or Bi-Level (black burst) syncs 50/59.94/60 Hz

Connector:

BNC 75 ohm type

Input Impedance:

75 ohm terminated

Maximum Input Voltage:

+/- 2 V

Specification:

Tri-level syncs (SMPTE274M and SMPTE296M) 600 mV pk-pk
PAL Black Burst (ITU624-4/SMPTE318) 1 V pk-pk,
Composite NTSC (SMPTE 170M) 1 V pk-pk

When operating as a reference output it has the following characteristics:

Supported Standards:

PAL-I, PAL-M, PAL-N, NTSC

Connector:

BNC 75 ohm type

Output Impedance:

75 ohm terminated

Output Level:

1 V into 75 ohm

Frequency Response:

DC to 5.8 Mhz +/- 1%

Waveform Accuracy:

< 1%

Vector Accuracy:

+/- 1°

SFP Cage (Option)

Interface:

Single Tx, Single Rx or Transceiver

Module Types:

Non-MSA Video Pinout conforming to SMPTE 297-2006

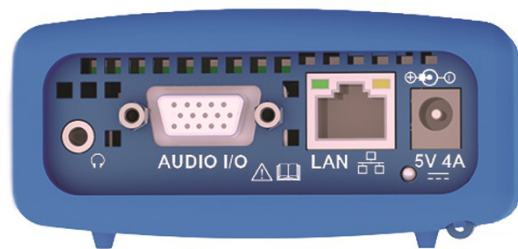
Supporting Fiber SD-SDI, HD-SDI and 3G-SDI

PHRXM-OPTAG (G02929-31CM) Transceiver

PHSFP-10SR-IP IP SFP module.

See: <https://www.phabrix.com> for supported modules.

Control Panel



The Sx TAG Control panel provides the following connections.

Power Connection

Voltage:

5 V +/- 5%. (DC Power adapter provided)

Power Requirements:

AC 90 to 250 V 50/60 Hz 10 W max

Networking

Ethernet:

IEEE802.3 10/100 Mb/s (10/100-base-T connection)

Ethernet Connector:

RJ-45

Purpose:

Browser control of instrument and FTP access to system files and allowing the Sx instrument to be connected into a network and accessed via TCP/IP so that it can be controlled remotely.

Audio I/O Connector

Connector Type:

15-way D-type, High Density, Female

Pin 1:

Analog balanced audio input Left +

Pin 2:

Analog balanced audio input Right +

Pin 3:

Analog balanced audio output Left +

Pin 4:	Analog balanced audio output Right +
Pin 5:	AES Audio Input
Pin 6:	0 V analog
Pin 7:	0 V analog
Pin 8:	0 V analog
Pin 9:	0 V analog
Pin 10:	0 V AES
Pin 11:	Analog balanced audio input Left –
Pin 12:	Analog balanced audio input Right –
Pin 13:	Analog balanced audio output Left –
Pin 14:	Analog balanced audio output Right +
Pin 15:	AES Audio Output

Analog Balanced Audio Input (15-Way Connector)

Input Impedance:

10 kohm terminated

Input Type:

Differential, AC coupled

Frequency Response:

50 Hz to 18 kHz +/- 1%

Maximum Input Voltage:

? V at 0 dBfs

Analog Balanced Audio Output (15-Way Connector)

Output Impedance:

10 kohm terminated

Output Type:

Differential, AC coupled

Frequency Response:

50 Hz to 18 kHz +/- 2%

Analyzer AES Input (15-Way Connector)

Input Impedance:

75 ohm terminated

Maximum Input Voltage:

+/- 2 V

Sample Rates:

The input has a sample rate converter and so will accept any sample rate from 32 kHz to 192 kHz.

Specification:

Conforming to AES3-2003 and SMPTE-276M

Generator AES Output (15-Way Connector)

Input Impedance:

75 ohm terminated

Output Voltage:

1 V

Sample Rates:

48 kHz

Specification:

Conforming to AES3-2003 and SMPTE-276M

Headphone Output

Connector:

Miniature 3.5 mm stereo jack

Level:

Adjustable

Purpose:

Local monitoring of audio

Local Control

USB:

USB 1

USB Connector:

Mini A/B

Purpose:

Software installation.

Supported SDI Video Formats

SMPTE Standards Link (Content)	Interface	Resolution	Sampling Structure	Pixel Depth	Frame / Field Rate	Sx TAG
SD 270 Mb/s Video Formats						
ST 259 (ST 125)	SD (625i)	720 x 576	4:2:2 (YCbCr)	10	50i	S
ST 259 (ST 125)	SD (525i)	720 x 485	4:2:2 (YCbCr)	10	59.94i	S
HD 1.485 Gb/s (SMPTE 292M)						
ST 292 (ST 296)	HD	1280 x 720	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p, 24p, 23.98p	S
ST 292 (ST 260)	HD	1920 x 1035	4:2:2 (YCbCr)	10	60i, 59.94i	S
ST 292 (ST 274)	HD	1920 x 1080	4:2:2 (YCbCr)	10	60i, 59.94i, 50i	S
ST 292 (ST 274)	HD	1920 x 1080	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	S
ST 292 (RP 211)	HD	1920 x 1080	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF	S
ST 292 (ST 2048-2)	HD	2048 x 1080	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	S
ST 292 (ST 2048-2)	HD	2048 x 1080	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF	S
3G Level-A 2.97 Gb/s (SMPTE 425-1)						
ST 425-1(ST 274)	3G Level A (1)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O
ST 425-1(ST 2048-2)	3G Level A (1)	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O
ST 425-1(ST 296)	3G Level A (2)	1280 x 720	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1(ST 274)	3G Level A (2)	1920 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60i, 59.94i, 50i 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1(ST 2048-2)	3G Level A (2)	2048 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1(ST 274)	3G Level A (3)	1920 x 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1(ST 2048-2)	3G Level A (3)	2048 x 1080	4:4:4 (YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1(ST 428-9)	3G Level A (3)	2048 x 1080	4:4:4 (XYZ)	12	24PsF, 23.98PsF	O
ST 425-1(ST 428-19)	3G Level A (3)	2048 x 1080	4:4:4 (XYZ)	12	30PsF, 29.97PsF, 25PsF	O
ST 425-1(ST 274)	3G Level A (4)	1920 x 1080	4:2:2 (YCbCr)	12	60i, 59.94i, 50i 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1(ST 2048-2)	3G Level A (4)	2048 x 1080	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
3G Level-B 2.97 Gb/s (SMPTE 425-1)						
ST 425-1(ST 274)	3G Level B-DL (I)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	O
ST 425-1(ST 2048-2)	3G Level B-DL (I)	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O

SMPTE Standards Link (Content)	Interface	Resolution	Sampling Structure	Pixel Depth	Frame / Field Rate	Sx TAG
ST 425-1 (ST 274)	3G Level B-DL (II)	1920 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60i, 59.94i, 50i 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1 (ST 2048-2)	3G Level B-DL (II)	2048 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1 (ST 274)	3G Level B-DL (III)	1920 x 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1 (ST 2048-2)	3G Level B-DL (III)	2048 x 1080	4:4:4 (YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1 (ST 428-9)	3G Level B-DL (III)	2048 x 1080	4:4:4 (XYZ)	12	24PsF, 23.98PsF	O
ST 425-1 (ST 428-19)	3G Level B-DL (III)	2048 x 1080	4:4:4 (XYZ)	12	30PsF, 29.97PsF, 25PsF	O
ST 425-1 (ST 274)	3G Level B-DL (IV)	1920 x 1080	4:2:2 (YCbCr)	12	60i, 59.94i, 50i 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1 (ST 2048-2)	3G Level B-DL (IV)	2048 x 1080	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1 (ST 296)	3G Level B-DS	2x (1280 x 720)	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1 (ST 274)	3G Level B-DS	2x (1920 x 1080)	4:2:2 (YCbCr)	10	60i, 59.94i, 50i 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O
ST 425-1 (ST 2048-2)	3G Level B-DS	2x (2048 x 1080)	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O

Key:

- **S:** Sx Standard
- **O:** Sx Option

ST 2022-6 Supported Video Formats (YCbCr 422 10 bit)

MN SET Format	Sx TAG Supported	emSFP Supported	PHABRIX Name	MN SET Name
HD 720p@23	Yes	Yes	720p23	720p23.98
HD 720p@24	Yes	Yes	720p24	720p24
HD 720p@25	Yes	Yes	720p25	720p25
HD 720p@29	Yes	Yes	720p29	720p29.97
HD 720p@30	Yes	Yes	720p30	720p30
HD 720p@50	Yes	Yes	720p50	720p50
HD 720p@59	Yes	Yes	720p59	720p59.94
HD 720p@60	Yes	Yes	720p60	720p60
HD 1080i@47	Yes	Yes	N/A	N/A
HD 1080i@48	Yes	Yes	N/A	N/A
HD 1080i@50	Yes	Yes	1080i50	1080i50
HD 1080i@59	Yes	Yes	1080i59	1080i59.94
HD 1080i@60	Yes	Yes	1080i60	1080i60
HD 1080sf@23	Yes	Yes	N/A	N/A
HD 1080sf@24	Yes	Yes	N/A	N/A
HD 1080sf@25	Yes	Yes	1080s25	1080psf25
HD 1080sf@29	Yes	Yes	1080s25	1080psf25
HD 1080sf@30	Yes	Yes	1080s25	1080psf25
HD 1080p@23	Yes	Yes	1080p23.98	1080p@23
HD 1080p@24	Yes	Yes	1080p24	1080p@24
HD 1080p@25	Yes	Yes	1080p25	1080p@25
HD 1080p@29	Yes	Yes	1080p29.97	1080p@29
HD 1080p@30	Yes	Yes	1080p30	1080p@30
HD 2K@23	Yes	Yes	HD-2Kp23	2048x1080p23.98
HD 2K@23	Yes	Yes	HD-2Kp23	2048x1080p24
HD 2K@23	Yes	Yes	HD-2Kp23	2048x1080p25
HD 2K@23	Yes	Yes	HD-2Kp23	2048x1080p29.97
HD 2K@23	Yes	Yes	HD-2Kp23	2048x1080p30
3GA 1080p@50	Yes	Yes	3GA-1080p50	3GA 1080p50

MN SET Format	Sx TAG Supported	emSFP Supported	PHABRIX Name	MN SET Name
3GA 1080p@59	Yes	Yes	3GA-1080p59	3GA 1080p59.94
3GA 1080p@60	Yes	Yes	3GA-1080p60	3GA 1080p60
3GA-2K 1080p@47	Yes	Yes	3GA-2Kp47	3GA 2048x1080p 47.95
3GA-2K 1080p@48	Yes	Yes	3GA-2Kp48	3GA 2048x1080p 48
3GA-2K 1080p@50	Yes	Yes	3GA-2Kp50	3GA 2048x1080p 50
3GA-2K 1080p@59	Yes	Yes	3GA-2Kp59	3GA 2048x1080p 59.94
3GA-2K 1080p@60	Yes	Yes	3GA-2Kp60	3GA 2048x1080p 60

ST 2110 Supported Video Formats (YCbCr 422 10 bit)

MN SET Format	Sx TAG Supported	emSFP Supported	PHABRIX Name	MN SET Name
HD 720p@23	Yes	Yes	720p23	720p23.98
HD 720p@24	Yes	Yes	720p24	720p24
HD 720p@25	Yes	Yes	720p25	720p25
HD 720p@29	Yes	Yes	720p29	720p29.97
HD 720p@30	Yes	Yes	720p30	720p30
HD 720p@50	Yes	Yes	720p50	720p50
HD 720p@59	Yes	Yes	720p59	720p59.94
HD 720p@60	Yes	Yes	720p60	720p60
HD 1080i@47	No	No	N/A	N/A
HD 1080i@48	No	No	N/A	N/A
HD 1080i@50	Yes	Yes	1080i50	1080i50
HD 1080i@59	Yes	Yes	1080i59	1080i59.94
HD 1080i@60	Yes	Yes	1080i60	1080i60
HD 1080sf@23	Yes	No	N/A	N/A
HD 1080sf@24	Yes	No	N/A	N/A
HD 1080sf@25	Yes	Yes	1080s25	1080psf25
HD 1080sf@29	Yes	Yes	1080s29	1080psf29
HD 1080sf@30	Yes	Yes	1080s30	1080psf30
HD 1080p@23	Yes	Yes	1080p23.98	1080p@23
HD 1080p@24	Yes	Yes	1080p24	1080p@24
HD 1080p@25	Yes	Yes	1080p25	1080p@25
HD 1080p@29	Yes	Yes	1080p29.97	1080p@29
HD 1080p@30	Yes	Yes	1080p30	1080p@30
HD 2K@23	N/A	N/A	HD-2Kp23	2048x1080p23.98
HD 2K@23	N/A	N/A	HD-2Kp23	2048x1080p24
HD 2K@23	N/A	N/A	HD-2Kp23	2048x1080p25
HD 2K@23	N/A	N/A	HD-2Kp23	2048x1080p29.97
HD 2K@23	N/A	N/A	HD-2Kp23	2048x1080p30
3GA 1080p@50	Yes	Yes	3GA-1080p50	3GA 1080p50

MN SET Format	Sx TAG Supported	emSFP Supported	PHABRIX Name	MN SET Name
3GA 1080p@59	Yes	Yes	3GA-1080p59	3GA 1080p59.94
3GA 1080p@60	Yes	Yes	3GA-1080p60	3GA 1080p60
3GA-2K 1080p@47	Yes	Yes	3GA-2Kp47	3GA 2048x1080p 47.95
3GA-2K 1080p@48	Yes	Yes	3GA-2Kp48	3GA 2048x1080p 48
3GA-2K 1080p@50	Yes	Yes	3GA-2Kp50	3GA 2048x1080p 50
3GA-2K 1080p@59	Yes	Yes	3GA-2Kp59	3GA 2048x1080p 59.94
3GA-2K 1080p@60	Yes	Yes	3GA-2Kp60	3GA 2048x1080p 60

Maintenance

Warranty

Overview

The Sx range benefits from a standard one year warranty including telephone and email support. You can choose to extend the warranty period for your device to either three or five years.

Each Sx leaves our UK factory with its own unique list of quality-controlled settings which are recorded by our manufacturing department. Should the Sx require calibration, these settings are compared with its pre- calibration state to ensure consistency and traceability.

The product has been designed and manufactured to be of the highest quality. However, should the instrument develop a fault during the warranty period, please return to your local PHABRIX agent for repair.

Calibration services are available throughout the PHABRIX network of distributors, see:

<https://www.phabrix.com>

Warranty Exceptions

PHABRIX are not responsible for free service during the warranty period under the following conditions:

- Incorrect voltage applied to instrument.
- Incorrect power adaptor used.
- Fire, natural disaster.
- Repair of instrument by non-PHABRIX approved agent.
- Repair of damage caused by third party products.
- Repair of damage caused by improper use.
- Repair without proof of purchase.

Product Registration

Please register your product on-line at: <https://www.phabrix.com>

Registering your product with PHABRIX ensures that you receive free email and telephone technical support, plus free software updates during your product's warranty lifetime.

Maintenance

General Maintenance

The Sx instruments have been designed to need minimum maintenance. The use of low power components means that there is no need for large amounts of cooling and therefore there is no need to clean fan filters.

The case can be cleaned by wiping gently with a soft cloth, lightly dampened with a neutral cleaning agent. A screen cleaning cloth may be used to clean the LCD. Do not apply force to the LCD when cleaning or it may be damaged.

Warning: Always remove the power supply from the instrument and turn OFF before cleaning. Do not allow any water or other liquid to enter the instrument while cleaning.

Preventative Maintenance

For long reliable use of the Sx instrument please take the following precautions:

- Install the Sx instrument in a position which has adequate air flow and is not in direct sunlight.
- Ensure that connecting cables are tied back so that they do not put strain on the rack mounts and that they do not obstruct air flow.
- Ensure that the fan grilles are not obstructed.
- Avoid installations where there are dramatic changes in temperature, high humidity and areas contaminated by dust, smoke or construction debris.
- Avoid installations that may be affected by vibration.
- Do not exceed the rated operation of the Sx instrument, i.e., temperature and signal levels.

Warning: The instrument should only be operated between 0 and 40° Celsius. If the instrument is operated at a higher temperature, there is a possibility of a fire hazard. If the temperature is changed rapidly from a cold environment to a hot environment, moisture can be created internally which can cause malfunction or damage the instrument. Allow the instrument to sit for 30 minutes without power applied to reduce any possibility of condensation. If the temperature rises above 60° Celsius a warning dialog will be given. If the temperature rises above 65° Celsius the instrument will be switched off. Under both conditions, an event will be added to the event log to show what happened.

Software Maintenance

Installing New Software

Note: Make sure that the unit is connected to an AC power source before starting the software upgrade. The software upgrade may take up to an hour to complete.

New software can be installed on the Sx instrument using two different techniques depending on the location of the Sx instrument, the type of network access that the Sx instrument has and you company's IT policy.

Note that during the installation process the instrument will not be available for use.

Note: Note also that any existing Presets stored will be archived and will need to be restored if they are required. See the section [Memories](#) for details on restoring presets archived by the installation of a new version of software.

Software Download from the Internet

Using the Sx instrument's LCD screen (access via a web browser), and the Sx instrument has Internet network access, you can download and install directly onto the Sx instrument from the browser:

This is a two-stage process, first the new software needs to be downloaded then the new software needs to be installed.

1. In the System - Network menu (Network window on Monitor Output) check that the network settings are correct and that the instrument is connected to the internet through the Ethernet connection.
2. From the System menu, select **Engineer** (Engineer Setup window on Monitor Output) to download the latest software version. Pressing the **Download** button will cause the current release of software to be downloaded from the PHABRIX website.

Note: Note that multiple releases of software may be stored on the Sx instrument so a previous release can be re-installed if required.

This will take a short time dependent on the connection to the Internet. Once the download has completed, the software will be checked for errors before being stored on the instrument for future installation. If the latest software is already present on the unit, no software will be downloaded and a message will be shown.

3. To install the downloaded software on the Sx instrument, select the release using the field with releases listed. The largest number is the latest release. Select the **Install** button and a confirmation dialog will be shown. Press **Yes** and the installation will start. This process takes several minutes to decompress the software, extract the files and then reprogram the hardware. If an error is given during the installation, retry the installation and or download. Do NOT switch the instrument off until an installation has completed correctly.

Once the installation has completed, if **Reboot after Install** is checked the instrument will restart with the new software installed. If not checked then the instrument should be switched off and on again manually.

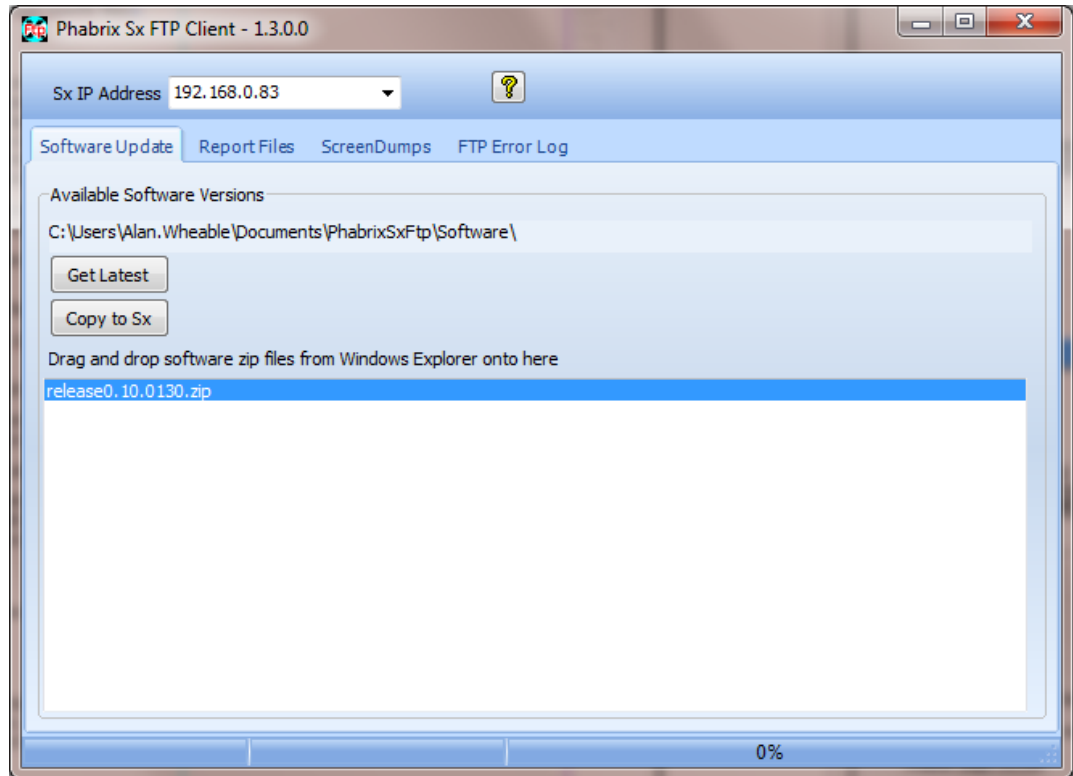
Note: As part of the installation procedure, all memories are archived to a backup file and then deleted. They can be restored from the **System → Memories** page using the **Restore** button and selecting the archive: **_Before_Upgrade**.

The software release notes can be viewed by selecting the **Changes** button.

FTP Transfer from a Connected PC

If the software cannot be installed, for example because the Sx instrument does not have Internet access, you can transfer the software files directly to the Setup folder of the Sx instrument using the PHABRIX FTP client:

1. Download the latest Sx software version from the PHABRIX website then drag the zip file to the PHABRIX FTP client (also available from the PHABRIX website).



To connect to the instrument, you will need to use the PHABRIX FTP client available from the PHABRIX website. This connects to the Sx unit using IP address of the unit (as host name) with:

- Username: **sxuser**
- Password: **phabrixsx**

2. In the PHABRIX FTP client enter the IP address of the Sx unit to be updated.

Note: If a static IP address has been assigned to your Sx unit, be sure also to set a valid default gateway address. Contact your network administrator for these. If connecting directly between the Sx and your PC, you must set the default gateway to the IP address of your PC. See [System – Network](#) for information on configuring the network settings on the Sx.

3. In the PHABRIX FTP client select the zip file for the new software and press the 'Copy to Sx' button.

This will copy the new software files to the Sx instrument's 'Setup' folder, updating the existing files as necessary. This can take up to 20 minutes depending on the connection speed.

4. Once the PHABRIX FTP client has finished copying the files to the Sx unit, use the menu: **System → Engineer** to locate the new software version in the **Software Upgrade** section of the menu, then select **Install**.

Wait for the new software to be installed. The progress will be indicated on screen.

During this time the software will be decompressed, files will be extracted and the hardware (FPGA) will be reprogrammed. If an error is given during the installation, retry the installation and or download. Do NOT turn the unit off until an installation has completed correctly.

Reverting to an Earlier Version of Software

If you need to revert to an earlier version of software:

1. Use the menu: **System → Engineer** to find the version of software you require in the **Software Upgrade** section of the menu then select **Install**.
2. Wait for the new software to be installed. The progress will be indicated on the front panel screen and on the Monitor output.

During this time the software will be decompressed, files will be extracted and the hardware (FPGAs) will be reprogrammed. If an error is given during the installation, retry the installation and or download. Do NOT turn the instrument off until an installation has completed correctly.

Sx File Structure

The Sx instrument uses Linux as its operating system and several directories in the file system are provided for user-specific files.

Patterns Directory

The Patterns directory contains several subdirectories for the related video standards. Test pattern files should be placed in the correct directory for the video standard in use. i.e., if a 720p video standard is being used, only the test patterns in the 720yuv directory will be available. You may have a test pattern with the same name in different pattern directories but they should have the correct size and color type (RGB/YUV) for the directory that they are in or they will be converted and may lose color accuracy.

Patterns that are too large for the current standard will be clipped to fit; patterns that are too small will gain a black border and will be centered on the output image.

Test patterns are **.pat** files for the standard line-based pattern files or user files. Supported user file formats are:

- Windows bitmap files (**.bmp**). We support 24 bit uncompressed bitmap formats only.
- 10 bit video files (**.dpx**) We support 10 bit RGB/YUV formats only in Left to Right orientation.
- Yuv and qnt files (8/10 bit packed yuv only)
- Targa (**.tga**) files which are compressed or uncompressed 8 bit RGB files. We support Left to Right orientation only.

Phabrix specific **.pat**, **.rgb**, **.yc4** files.

Note: Note that bitmap files which are RGB will be converted to YUV internally as appropriate to the output standard. This will mean that not all valid YUV values can be output. If dpx YUV files are used then all valid values may be output.

Scripts Directory

Command scripts may be downloaded into this directory.

Setup Directory

The Setup directory contains the installer files for different releases of the software. Each release is comprised of a .tar.gz file and is self-contained. If a release of software is copied onto the instrument, the list of available releases will be updated within a minute.

Idents Directory

The Idents directory contains bitmap idents as used by the generator. Supported user file formats are:

- **.bmp** (Windows bitmap files: 24 bit only)
- **.dpx** files (10 bit video files)
- **.yuv** files (8/10 bit packed yuv)
- **.tga** (targa files)

Note: Note that bitmap files are RGB and will be converted to YUV internally as appropriate to the output standard. This will mean that not all valid YUV values can be output. If YUV files are used(.dpx), then all valid values may be output.

Fonts

The fonts available for use by the generator to add text idents may be enhanced by downloading new True Type fonts (**.ttf**) into this directory.

MN SET

Installing MN SET Control Software

Overview

MN SET version 5.1 (or higher) is control and configuration software from Riedel GmbH, which PHABRIX supports and makes available to help set-up and configure the emSFPs purchased with your Sx TAG.

To download the software, navigate to the Software Downloads page of the PHABRIX website:

<https://www.phabrix.com/support/product-software-downloads/>

You can use the MN SET application to configure a variety of Riedel processing modules. In addition, you can use the application to configure, monitor and control the routing of SMPTE 2110 flows by communicating with individual modules inside your network space. MN SET is designed as server/client software; you can install the server software on one PC and multiple instances of clients can connect to the server remotely or locally, using an internet browser.

MN SET supports the manual configuration of mDNS, DNS-SD and domain name and the IP address of the NMOS registry via the emSFP REST API.

Prerequisites

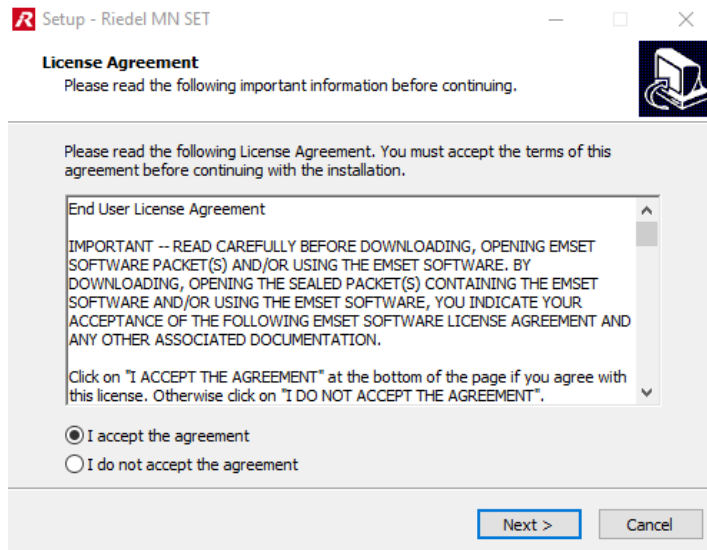
Make sure that your system meets at least the following minimum prerequisites to run the MN SET server or client software:

- Intel Core i5 CPU 2.39 GHz or equivalent
- Microsoft Windows x86 (32 bit) or x64 (64 bit) or Linux operating system
- x64 or x86 base processor
- A supported HTML browser, for example: Internet Explorer 11+, Microsoft Edge 41+, Mozilla Firefox 58+, Chrome 63+ or higher.

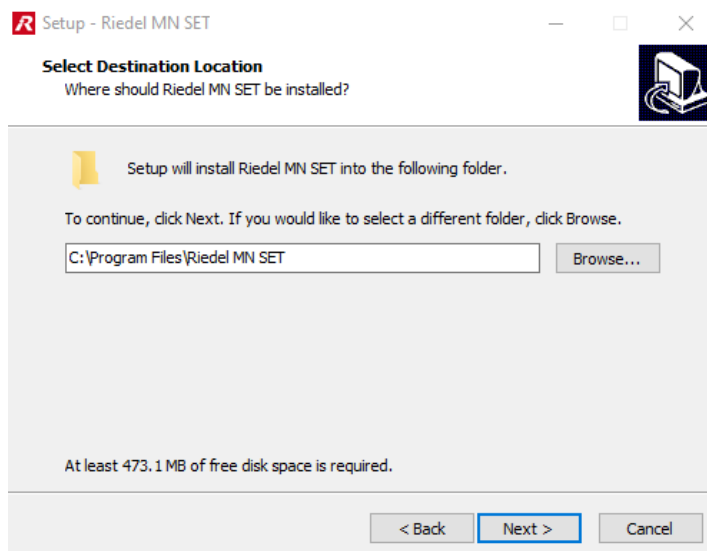
Installing the MN SET Software

Install the MN SET software as follows:

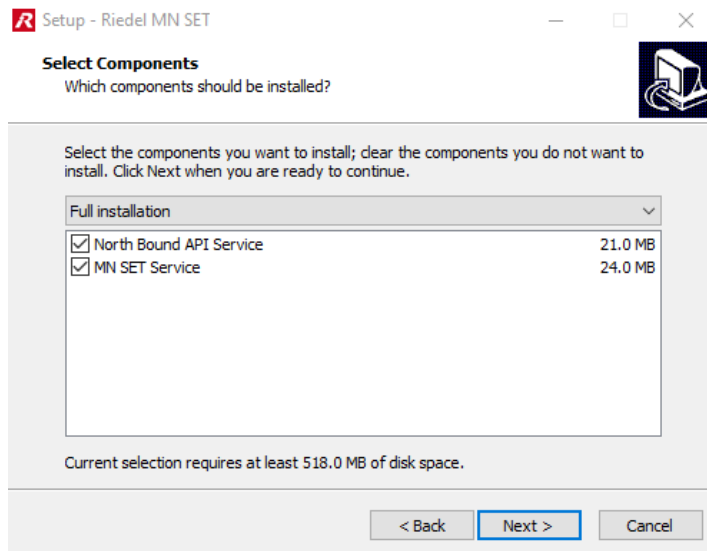
1. Navigate to the PHABRIX software downloads page:
<https://www.phabrix.com/support/product-software-downloads/>
2. Download the appropriate software for your operating system, for example: MN SET 5.10 (Windows 64 bit).
3. Double-click the downloaded executable (mnset-5.10-1-x64.exe) to run the installation wizard.
4. Accept the End User License then click Next.



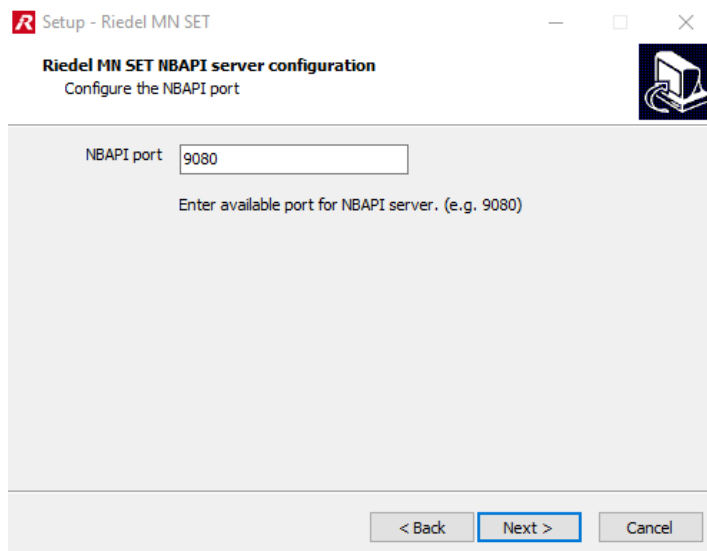
5. Accept the default install folder (default C:\Program Files\Riedel MN SET) then click Next.



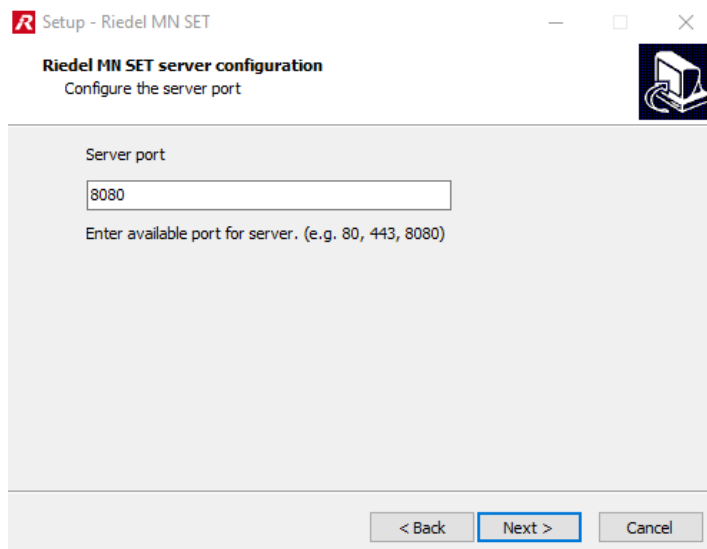
6. Select all software components then click Next.



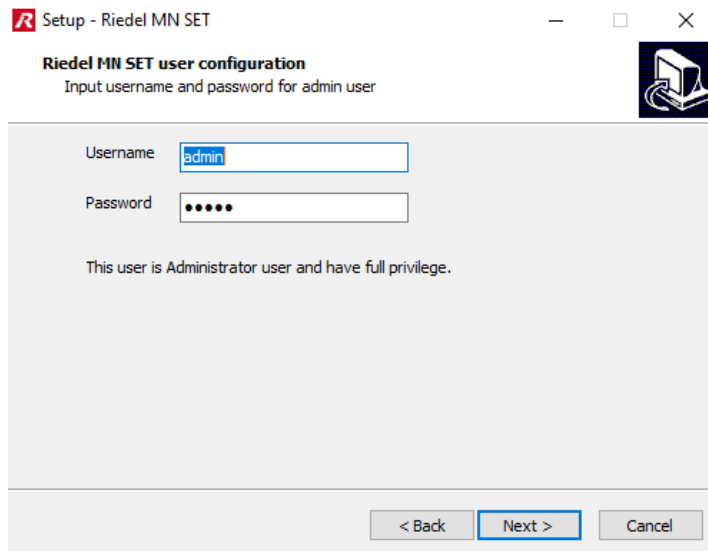
7. Specify the NAPI (Northbound API) server port as required (default 9080) then click Next.



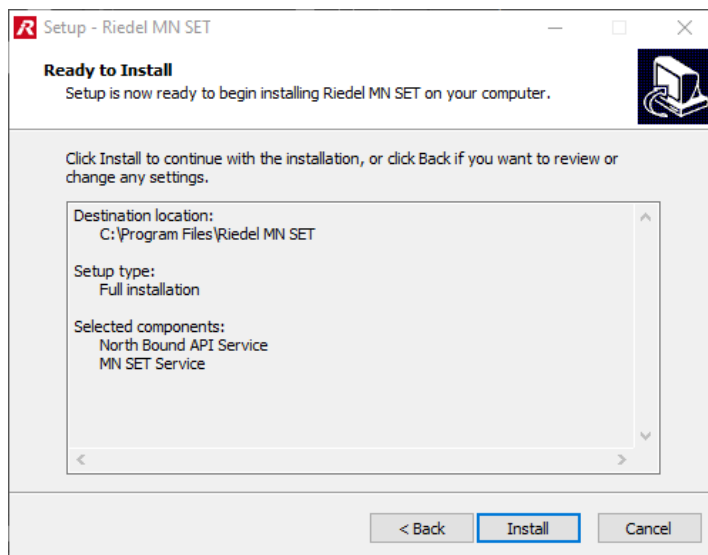
8. Specify the server port as required (default 8080) then click Next.



9. Enter the preferred user name and password for the administrator account then click Next.

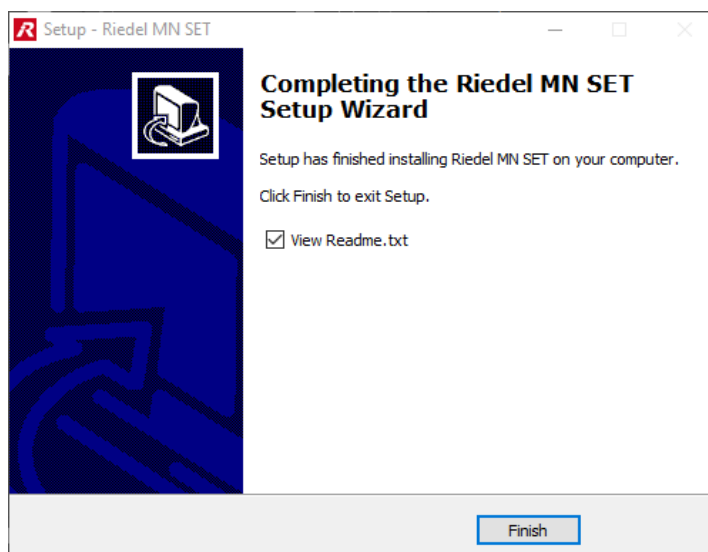


10. Click Install to install the MN SET software.



You will see the installation progress displayed.

11. On completion, click Finish and review the Readme file.



Running the Client Application

To run the MN SET client application locally, open a browser on your local PC and enter the following:

<http://localhost:8080>

To run the MN SET client application remotely, open a browser on a remote PC and enter the following:

[http://server_IP address:8080](http://server_IP_address:8080)

Note that the Riedel MN SET service starts automatically at boot-up.

All scripts used to start and stop the server must be run with administrator privileges.

Logging In to MN SET

Login to MN SET using the default user settings as follows:

- User: **admin**
- Password: **admin**

Make sure to edit the Discovery Range under the Server Setup panel of the MN SET Admin Page. You will need to add a range of IP addresses that your SFPs fall under, otherwise you will not see your devices.

For additional information, it is recommended to read the User Guide located in the installation directory of MN SET.

Further Information

For more information on using the MN SET application to control and configure your emSFPs for use with the Sx TAG, see the MN Set User Guide for version 5.1 (or higher), available from the Software Downloads page of the PHABRIX website:

<https://www.phabrix.com/support/product-software-downloads/>



www.phabrix.com



PHABRIX products are continuously being updated.
Please visit www.phabrix.com for latest product information